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Provision for aiding and strengthening the great national industry of agriculture through a central agency was slow in coming in the United States. With a separateness which was long characteristic the States were left to their own devices, and it was not conceived to be the policy of the General Government to concern itself with the subject. Its vast public domain, much of which was then considered useless for agriculture, was in charge of a land office whose functions were restricted to its survey and record and disposal under federal laws.

As early as 1796 the suggestion of federal aid for the promotion of agriculture was made by President George Washington, who laid before Congress a plan for an agency modeled after the British Board of Agriculture, of which he was an honorary member. But Congress failed to act on this suggestion, as it did on a similar proposal which came from the Agricultural Society of Berkley, Mass., in 1817.

In the course of time, however, the use of public funds for agricultural work began to be practiced, plants, seeds and animals being introduced through the Consular Service and turned over for distribution to the Patent Office, which was then under the State Department. When Henry L. Ellsworth, a practical Connecticut farmer, became Commissioner of Patents in 1836, he gave special attention to the distribution of seeds and plants, and in 1839 he secured a Congressional appropriation of \$1,000 "for the purpose of collecting and distributing seeds, prosecuting agricultural investigations, and procuring agricultural statistics."

Commissioner Ellsworth gave in his report for 1842 a prophetic view of what the application of science would mean to agricultural production. But there were many doubters, not only of the value of science as applied to agriculture, but also of the desirability of government aid to agriculture. This is evidenced by fluctuating appropriations, which at times were cut off entirely. After the Patent Office was transferred to the Interior Department, in 1849, the appropriations increased, a chemist, botanist, and statistician were employed, meteorological data were regularly furnished by the Smith-

sonian Institution, and information on many agricultural subjects was published in the annual reports. In this period the principle was gradually established of governmental promotion of agriculture, not only through the distribution of seeds, but through the employment of science.

With the coming of Lincoln's administration a plan was put forward by David P. Holloway, Commissioner of Patents, for the creation of "a department of the productive arts." Congress adopted a portion of the commissioner's plan and established a department of agriculture, President Lincoln signing the act May 15, 1862. The new department was formally organized on July first of that year, in the rooms of the Patent Office previously occupied by the agricultural division; and on the following day, July 2, President Lincoln signed the Morrill Act.

Thus it came about that the provision of a national agency for agriculture and of federal aid for the establishment of agricultural education, both of which had long been urged, were realized at the same time, and at a time when the country was in the midst of its mighty struggle for union. It is worthy of note also that on May 20 of that year President Lincoln set his approval on the Homestead Act, culminating an agitation for the settling of the public lands which had been a national issue for ten years previous. It is remarkable that these three events, which have been of such fundamental importance to the agriculture of this country, should all have been culminated within a period of less than six weeks.

From these small and uncertain beginnings, there has resulted in the period of fifty years since the Department of Agriculture was formally established an organization for the administration of law, prosecution of research, and the collection and dissemination of knowledge "the like of which is unknown in any other country or any other time."

The history of the rise of the Department through successive commissioners and secretaries, its elevation to the first rank in the executive branch of the Government in 1888, and its present magnitude and scope, were sketched in the interesting address of Dr. A. C. True at the Atlanta convention of the Association of American Agricultural Colleges and Experiment Stations in November. It was the only observance of this important anniversary. Anniversaries of events of far less import to the American people have been observed in a national way, in a manner to draw public attention to them and emphasize their epoch-making character.

Appreciation of the Department's work and position has come mainly in quite recent years. Until then it was known to many as an agency for the distribution of free seeds, and it had little standing as an institution for agricultural investigation. Its larger growth

is a notable triumph of agricultural science. Nothing else could have given it the dignified standing and the confidence which it now enjoys. The demonstration of science as the fundamental basis of agriculture, of its ability to cast aside the cloak of tradition and superstition and mystery which enveloped it, and to provide an intelligent and reasoning basis for practice, has placed agriculture as an industry on a very different footing in the eyes of the people, as it has also the institutions representing it. Nothing has done so much to impress upon the public the intimate and helpful relation of science to daily life, to educate it to the belief in science as something very real and essential and for universal use, rather than something abstract and incomprehensible and for the pursuit of the few.

In a recent address Dr. David Starr Jordan expressed some thoughts which are well worth considering in this connection, for, although he was speaking primarily of medicine, his deductions are especially applicable to the subject under discussion. After laying down the principle that all art is based on science, and defining science as "human experience tested and set in order," he said:

"Art is knowledge in action, and art which is not based on knowledge becomes a mystery or a trade. The practice of medicine [or agriculture] through the ages has been one or the other or both. It is a trade when the physician's [farmer's] apprentice follows his master about, learns his ways, his prescriptions, and his professional dignity. It is a mystery when practice is based on some theory . . . which goes outside of human experience for its justification. Science is alike to all men who have grasped its data and its conclusions. Art will vary with the personality of the individual who practices it."

Agriculture and the practice of farming have passed through the stage of mystery to that of a trade with professional aspects. Modern scientific agriculture aims to replace tradition with well-established facts. While the art varies with the individual who practices, it is now based on knowledge, i. e., on experience viewed in the light of science. This is its essential characteristic, and the ability to call science into the service of agriculture is a modern accomplishment.

The limitations of experience unaided, and its inadequacy to progress, were well set forth by Dr. H. C. White in his Atlanta address on the American Experiment Stations. The application of original investigation to supplement and extend the experience and observations of daily life marked a new era in the acquisition of knowledge.

Dr. White said: "When Patrick Henry declared that he knew of no lamp by which to guide his feet but that of experience, he spake as a man of the eighteenth century and those which had gone before. For untold centuries individual and traditional experience was counted the safest if not the only guide to conduct. In the great industry of agriculture, in which men had been engaged since the

beginning of human history, experience in like manner had been the school in which instruction had been sought for proficiency in the art and improvement of its processes. The value of experience surely is not to be disdained. On the contrary it is a very efficient corrective of error, and men do well to maintain its historic continuity for the avoidance of fault and the elimination of blunder.

"But while experience may be safe, it is after all but an unintelligent and unprogressive monitor. Certainly in the case of agriculture it has proven its inadequacy to progress. For it may be doubted if agricultural practice or agricultural production in Europe in the eighteenth century were in any large degree superior to those of ancient Babylonia, Egypt, Greece, or Rome. It was only when the truly scientific spirit of inquiry into the causes and reasons of phenomena was loosened upon the world that conduct and practice could be based upon an illuminating knowledge and no longer guided by a blind experience."

There is little in mere handicraft that can be taught; it must mostly be acquired by experience. Hence the development of such agencies as the agricultural colleges and the Department of Agriculture waited largely on the development of the scientific stage and the explanation of the principles involved. With the application of science and its dissemination, all of these agencies grew in power and resources and size, so that in a remarkable degree they are to be regarded as products of their own activities. The great industry of agriculture has developed with them and very largely as a result of them, and to them is unmistakably due the present position of agriculture as an industry and its efficiency as an occupation.

But there were other conditions in this country which retarded for a time the higher development of agriculture and had a great influence on the progress of these agricultural institutions. Among these were the operations of the Homestead Act, which, as we have seen, came into effect at the same time that the Department and the agricultural colleges were provided for. Other conditions were economic in their nature, and these we are still struggling with.

The Homestead Act promoted on a vast scale the rapid expansion of our agriculture, causing the occupation of the available farm land in a half century and distributing this land among millions of small proprietors. This brought about the production of enormous wealth as the basis for the development of commerce, manufacturing, education and social life. It broadened our more conservative and substantial electorate to such an extent as to enable us to meet the problems arising from vast combinations of capital and labor, so that today we have a fair opportunity for their successful solution.

Looked at from another angle, the Homestead Act brought about conditions which prevented for many years the proper development

of agricultural education in our colleges and schools, and hindered the progress of the Department of Agriculture and the experiment stations. As long as there was plenty of free land and agriculture was being spread out by the simplest methods beyond the immediate needs of the nation, although the aggregate of agricultural production greatly increased, the price of agricultural products constantly tended to fall below the level of profit. Agriculture thus became a backward and depressed industry. The generation of pioneer farmers who had rushed in so eagerly to acquire the free lands became disgusted with the financial outcome and outlook of this business, and sought every avenue of escape from it for their children. Hence the agricultural colleges, begun with much enthusiasm, found little support from the farmers, and after a time began to lose even the meager number of students at first attracted to them.

The Department of Agriculture and the early experiment stations had little encouragement to collect the knowledge on which alone efficient courses in agriculture could be constructed, and remained in a weak and neglected condition. Fortunately there were leaders who saw that this condition of affairs could not last, and that the time would come when the farmers would need help and be eager to receive it. The passage of the Hatch Act, twenty-five years ago, marks the turning of the tide.

In commenting on the change of conditions which has come with passage of years, Dr. True said:

"From being a simple and depressed industry, agriculture is becoming a highly complicated and progressive industry. The universal use of machinery, the necessary changes in methods, crops, and animal husbandry, to meet the new and varied demands of different regions, have caused an unparalleled reorganization of agricultural industries. The many successful applications of science to agriculture, and the evident need of technical education in agricultural science and practice, have caused the establishment in the United States of the most comprehensive and far-reaching system of agricultural research and education ever devised."

The Department is approaching the close of four successive administrations under the same guiding hand, a period of sixteen years of marvelous growth and development which have far surpassed the combined product of all the previous years. Some of the facts of this growth are brought together in the last annual report of the Secretary of Agriculture, in a retrospect which furnishes a basis for measuring the present scope and diversity of this national agency. These are only faintly indicated by its present income of \$24,743,044 and its force of 13,358 employees.

The present functions of the Department may be broadly classified as (1) administrative, (2) advisory, (3) investigational, (4) informational, and (5) educational. These have been so far developed and expanded that the Department's business vitally affects the daily life of all our people.

Under administrative duties are included those relating to the enforcement of the meat inspection, carried on at nearly one thousand establishments in two hundred and fifty-nine cities and towns; the inspection of foods and drugs, insecticides and fungicides, with regard to both domestic and imported products, which is conducted through the laboratory of the Bureau of Chemistry at Washington and its twenty-five branch laboratories throughout the country; the control and quarantine rendered necessary by sheep and cattle diseases and the inspection of cattle-carrying vessels; the management of the national forests, embracing one hundred and eighty-five million acres, or nearly three hundred thousand square miles of territory; the regulation of interstate commerce of game animals and the control of the importation of noxious and other animals; the Congressional seed distribution; the supervision of the federal funds granted to the state experiment stations; and the direct management of stations in Alaska, Hawaii, Porto Rico, and Guam.

In its advisory capacity, the Department conducts a vast and varied correspondence. Besides this there are some large operations which have in them an important advisory factor. Such, for example, are the daily weather forecasts, the monthly crop reports, the national soil survey, and the cooperative farm demonstration work. Many agents of the Department are now giving much of their time to personally advising the farmers in the districts where they are located. Notable examples of this are the services of the Department's road, irrigation, and drainage engineers. In a similar way this Office has a broad influence on the development of the agricultural colleges, schools, and experiment stations.

The technical, scientific, and practical investigations of the Department now constitute a large share of its business and cover a very wide range. All of the bureaus are engaged in this work, and their projects cover practically every department of agricultural inquiry. They include laboratory investigations in the various sciences bearing on agricultural problems, field experiments in many States and Territories, studies of natural conditions and agricultural possibilities on a large scale, the exploration of foreign countries for plants, beneficial insects, etc., the devising of means to defend the farmer against flood or to protect him against the ravages of insects and diseases, engineering studies on road building, irrigation, and drainage, economic studies relating to farm management, cost of production, etc., etc.

Taken together, these projects constitute the largest amount of definite and systematic investigation, agricultural or otherwise, conducted under a single organization anywhere in the world. United with the similar work of the state experiment stations, they are accumulating a body of knowledge relating to agriculture which already constitutes by far the largest contribution to the science of agriculture. In this way a broad, sure, and permanent foundation for the future agricultural prosperity of the United States is being laid.

As perhaps a natural outgrowth of its functions relating to the industry which is most fundamental to human life and civilization, the Department has taken on an increasing amount of work outside the field of agriculture. Such, for example, is a large part of the meteorological work of the Weather Bureau, the inspection of drugs, investigations on human nutrition, studies of household and disease-causing insects, biological investigations relating to human diseases, etc. Part of this has been given to the Department under a wise administrative policy which seeks to make the most effective use of existing governmental agencies and facilities, instead of creating new ones.

As a public agency for the dissemination of information on agricultural subjects the work of the Department has reached vast proportions. During the year ended June 30, 1912, it issued 2,110 publications, aggregating 34,678,557 copies. Many of these are technical reports of scientific investigations, published in small editions, but others are popular in character and are widely distributed. Over nine million copies of Farmers' Bulletins are sent out annually, and as they are distributed largely through Congressmen they go into all the rural districts. The "Yearbook," a bound volume of about seven hundred pages, has an edition of a half million copies.

For many years past three technical periodicals have been issued—the Monthly Weather Review, the Crop Reporter, and Experiment Station Record. These are given wide distribution in this country and to a considerable extent abroad. In addition, the Bulletin of the Mount Weather Observatory is issued in a periodical series, and the Library puts out a Monthly Bulletin.

Included in the special equipment of the Department are three farms, one at Arlington, Va., of about four hundred acres, for plant work; another of about fifty acres at Bethesda, Md., for use in the study of animal diseases; and a comparatively new farm at Beltsville, Md., of four hundred and seventy-five acres of land, for experiments in animal husbandry and dairying.

The Department's Library contains a collection of 122,000 books and pamphlets, chiefly on agriculture and related sciences, and as far as known is the largest agricultural library extant. Nearly two thou-

sand periodicals are received currently. Its books are lent to workers all over the country, loans being made the past year in thirty-nine different States and Territories, serving in this way as a national library of agriculture.

Such is the present magnitude of the national department which stands for agriculture and for the broader relations of human welfare. It is no local institution but is national in the broadest sense. Its constituency is ninety million people who profit by its manifold activities in a thousand ways, and its field is every State and the island possessions, through which its local offices and laboratories and over eleven thousand of its workers are scattered. It has no regard for sectional divisions or political affiliations. Nor does it work unto itself, for in these years of development the principle of cooperation between the Nation and the State has been permanently established.

The past sixteen years is a remarkable record of growth in resources and responsibilities and lines of endeavor, a growth in which the personnel has been multiplied more than five times and the revenues nearly seven times. This has been built upon a confidence born of accomplishment and a widening view of the functions of the Federal Government.

The history of the experiment station movement in the United States has often been told in these pages and in other publications. Dr. White, in his admirable paper, reviewed this history in the light of contemporary conditions of agriculture and of science, and gave a forecast of future development.

Starting with the establishment of the first experiment station in Connecticut in 1875, the growth of stations under state patronage was slow and their revenues comparatively small up to the time when the movement became national. These pioneer stations, however, demonstrated the usefulness of such institutions and prepared the public mind and the national legislature for the important step which culminated in the passage of the Hatch Act on March 2, 1887. They furnished a vision and an imagination which enabled a foreshadowing of the work to be done.

The inadequacy of the existing basis for agricultural instruction had been realized by the agricultural colleges for several years, as had been the inability of the colleges under their limited organization to develop that basis as it should be. A convention of representatives of the land-grant colleges, held in Washington in 1883, approved a plan for the establishment of a station at each of the colleges, and a subsequent convention in 1885 reaffirmed this approval. Several bills providing federal appropriation were presented in succeeding Congresses, and strongly pressed by the agricultural colleges and the then existing experiment stations, but it was not until

1887 that a bill introduced by Hon. William H. Hatch, of Missouri, was enacted by Congress and approved by President Cleveland. Thus came into existence, a quarter of a century ago, that great arm of the public service, the American agricultural experiment station, which in this relatively short period has given such an impetus to agricultural education and to a more intelligent agriculture, and been a national force for the instruction of the farmer.

The stations were regarded as state institutions from the beginning, and this subjected them to local conditions, pecuniary, political, and administrative, which for a time retarded their proper development in some instances. In the early period "it was inevitable that there should have been more or less of groping after stability and accurate consciousness of purpose. There was undoubtedly much effort that was unwise, much labor that was useless, much duplication that was unnecessary, much wastefulness of both energy and means."

Gradually, however, these conditions were remedied. Greater stability prevailed. The true mission of the station, the necessity for freedom from interference and large liberty in developing its methods and conducting its studies, were recognized and secured. As time passed and their potential capabilities were made manifest, the need developed for larger appropriations and for a more fundamental character of investigation. "In the first place, their resources were inadequate to their needs. States and communities had not yet been quickened to a sufficient supplementing of the initial federal grants. In the second place, the time had arrived when mere experimentation for the repeated corroboration of fairly well established truths should largely cease, and research and investigation for the acquiring of new and larger truths be more extensively prosecuted."

This resulted in the passage of an act introduced by Henry Cullen Adams, of Wisconsin, which was signed by President Roosevelt March 16, 1906. This new act doubled the federal appropriation to the stations in a period of five years, the federal appropriation reaching \$30,000 to each State in 1911, or a total of \$1,440,000 a year. Its terms were so drawn as to restrict the use of the new appropriation to the conduct of original investigation and research, as distinguished from the simpler experiments and trials which had been so much in demand. The standards set soon affected the work of the stations as a whole, resulting in a higher grade of product, and led to a sharper definition of their duties as distinguished from those of the teaching departments of the college and the manifold enterprises for extension teaching. The new provision called for more thoroughly trained men; and the differentiation of duties, with the larger freedom for concentration on research, attracted a class of workers who had heretofore looked askance at the experiment station as a field of activity.

Reviewing this new era, Dr. White said: "In the six years since the passage of the Adams Act the work and utility of the stations have enormously increased and expanded. Desultory and inconsequent experimentation has been largely discontinued; definiteness in experiment work has been more clearly established, and genuine scientific research along all the lines of the natural sciences related to agriculture have been begun. A large and able body of competent investigators has been developed, and the quality and value of their work challenges admiring comparison with the output of the laboratories of the world devoted to pure research in all the branches of biology, chemistry, and physics. Through the station publications and otherwise a body of new truth, demonstrated or suspected, has been given immediately to the workers in the fields for adoption, scrutiny, or test, and as a result it is probably true that in America scientific agriculture—and that means intelligent agriculture, economic agriculture—has made greater progress in the last ten years than in all the years which went before."

In the six years since the Adams Act passed, the revenues of the stations from federal and state sources have nearly doubled, amounting in the fiscal year 1912 to practically \$3,850,000, while the staff of officers and workers has increased nearly 85 per cent, the rolls at the close of 1912 numbering no less than 1,750 persons.

Dr. White outlined the modern conception of the experiment station as that of "a scientific laboratory in the fullest and purest sense, given over to varied but purely scientific work, with fields and barns and herds ranking with microscope, balance, and burette as mere implements of research. It is experimental only so far as it may test, on a strictly laboratory scale, the suggestions of research. It is the investigative department of the college to which it may be attached and, as such, may be called upon only to furnish new truths to be taught in the class room and the laboratory, in the extension lecture and on the demonstration farm. With this distinctive and restricted purpose the field of its operation is yet ample and sufficient. . . .

"The acquisition of knowledge must precede its application, and further real progress in agriculture must, therefore, come not so much from improved instruction in the schools, from increase in our extension teaching, or from demonstration in the field, valuable and important as these may be, but mainly from research in the station laboratory. . . .

"And yet a greater service may the station render to the State. Among all the public institutions, it should stand preeminently to illustrate the persistent, untiring search for truth. . . . For it is the search after truth that is the basis of moral training, and it is the possession of truth that, alone, shall make us free."

Throughout the last quarter century of development, the Department of Agriculture has been in close cooperation with the Association of American Agricultural Colleges and Experiment Stations and the institutions represented in it. There has also been a constant interchange between them. One secretary and three assistant secretaries have come from the agricultural colleges and experiment stations. Numerous subordinate officers, especially in the scientific service, have been drawn from these institutions, where they have received their special training. On the other hand, many Department officers have gone into the faculties of the agricultural colleges and the staffs of the experiment stations. Constantly increasing, and in the aggregate large, amounts of Department funds have been used in cooperation with the colleges and stations in a great variety of enterprises.

This is a natural and a happy condition, a recognition of the fact that problems and principles are broader than institutions or men, and that in their common effort for the advancement of agriculture through investigation and demonstration the facilities of the National Department and the state experiment stations supplement each other. Each has shared in the other's progress and achievements, and the success and influence of the one can rarely be adequately measured without recognition of the other.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Phytin and pyrophosphoric acid esters of inosit, II, R. J. ANDERSON (*New York State Sta. Tech. Bul.* 21, pp. 3-16).—Continuing previous work (E. S. R., 27, p. 406), the author describes as new salts of phytic acid, calcium-magnesium-potassium phytate, penta-calcium phytate, tetra-calcium phytate, penta-magnesium phytate, the copper salts obtained when precipitating phytic acid with copper acetate, octa-silver phytate, and hepta-silver phytate. "Efforts to synthesize phytic acid by acting on dry inosit with dry pyrophosphoric acid lead to the formation of esters. Two of these, viz, the di-pyrophosphoric acid ester of inosit and a di-inosit tri-pyrophosphoric acid ester were obtained in pure form and analyzed. These esters are very similar to phytic acid in appearance, taste, and reactions. They yield similar acid salts and on hydrolysis inosit and phosphoric acid are produced."

The study was conducted in conjunction with an investigation in regard to the form in which phytin exists in wheat bran, and which will be reported upon later.

Studies on enzym action.—I, Some experiments with the castor bean lipase, K. G. FALK and J. M. NELSON (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 5, pp. 735-745).—A comparative study was made of the hydrolysis of methyl acetate, ethyl butyrate, and olive oil caused by the castor bean lipase. Adding small amounts of alkali at the beginning of the action had no appreciable influence on the subsequent hydrolysis with methyl acetate, but with ethyl butyrate the action was different, depending upon the amounts of alkali added.

"In ether saturated with water, and acetone containing a small amount of water, as solvents, methyl acetate was hydrolyzed to a considerable extent with lipase both at the ordinary and at more elevated temperatures. Small amounts of an active constituent were extracted from the lipase preparation by water and by ethyl acetate. By the electrolysis in water of the lipase preparation, a substance was produced in the anode solution, probably by oxidation, showing marked hydrolytic action."

Rôle of electrolytes in the action of ferments of animal origin, H. BIERST (*Biochem. Ztschr.*, 40 (1912), No. 5-6, pp. 357-369).—It was found that the pancreatic and gastric juices of dogs lost their starch-hydrolyzing property when subjected to dialysis with distilled water. The presence of chlorine or bromine ions was found to be absolutely essential to the activity of animal amylases. Vegetable amylase and lactase, and emulsin of animal origin, retain their clearing power even when chlorids are absent.

The hydrolytic action of hydrogen peroxid, C. NEUBERG and S. MITKA (*Biochem. Ztschr.*, 36 (1911), No. 1, pp. 37-43).—The preparations used in this work were ovalbumin, gelatin, glycogen, various starches, inulin, nucleic acid from yeast, the sulphuric acid salt of chondroitin, and lecithin. Marked clearing was noted at ordinary temperatures with all of these substances.

The ignition of precipitates without the use of the blast lamp, P. H. WALKER and J. B. WILSON (*U. S. Dept. Agr., Bur. Chem. Circ. 101*, pp. 8).—"An attempt has been made to determine whether alumina and silica can be ignited to constant weight without the use of a blast lamp, and as a result the authors are of the opinion that with slow initial ignition and final heating at the highest temperature that can be obtained with a burner, silica is practically always reduced to constant weight in 2 hours and generally in 1 hour. Alumina requires a somewhat longer period. About 3 hours reduces the weight to within the limit of error of the determination."

Precipitating agents for amino acids, C. NEUBERG and J. KERN (*Biochem. Ztschr.*, 40 (1912), No. 5-6, pp. 438-502).—A universal precipitating agent for amino acids was found in a solution of mercuric acetate made alkaline with sodium carbonate. If to a solution of glycocoll, a saturated or a 10 per cent solution of sodium carbonate is added to alkalinity and then followed with a 25 per cent solution of mercuric acetate a white precipitate is obtained. By the judicious addition of the reagents in turn and then alcohol, a dense white precipitate is produced which is nearly quantitative. The process consists not only in obtaining the mercuric salt of the amino acid but also represents a complicated reaction in which the elements which constitute carbon dioxide come into play. Probably the basic salts of the corresponding carbamic acids are involved. The method does not possess the sharpness or definiteness of phosphotungstic acid with the diamino acids.

A delicate method for determining minute quantities of chlorophyll, C. A. JACOBSON (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 9, pp. 1266-1269, pls. 4).—A description is given of a method for determining the quantity of chlorophyll in leaves with a green weight less than 1 gm. This consists of a comparison of the intensity of the chlorophyll absorption bands of the solution to be examined with the intensity of the corresponding bands produced by solutions of known concentrations.

Colorimetric determination of phosphoric acid in arable soils, C. R. HERNANDEZ (*An. Inst. Méd. Nac. [Mexico]*, 10 (1908), pp. 271-276; *abs. in Chem. Abs.*, 6 (1912), No. 5, p. 662).—The method is as follows:

"Twenty gm. soil, dried at 110°, are heated to low redness in a platinum crucible to destroy organic matter and digested with nitric acid on a water bath for 5 hours with frequent shaking. The filtered solution is evaporated to dryness in a platinum dish, the oxides of iron and aluminum dissolved in 3 cc. each of nitric acid and water, and filtered from silica. The temperature should be kept below 120° in order to prevent formation of alkali and alkaline earth silicates which would later form silicomolybdates. The filtrate is precipitated with ammonium molybdate, the precipitate dissolved in ammonia and, after addition of potassium ferrocyanid, compared with a standard solution prepared from pure acid sodium phosphate. Citrate-soluble phosphoric acid may be determined in a similar manner."

Determination of moisture in cereals and cereal products, A. FORNET (*Ztschr. Gesam. Getreidew.*, 3 (1911), Nos. 4, pp. 92-98; 5, pp. 113-118; 4 (1912), No. 3, pp. 73-77, figs. 3).—This is a study of methods. It considers the various temperatures and apparatus proposed for determining the moisture in cereals and cereal products, and also points out their disadvantages, particularly the Duval (*E. S. R.*, 18, p. 1122) and Hoffmann apparatus.

The author also describes a rapid drying apparatus, which utilizes a current of air and a temperature of 160° C. He finds that working under these conditions the apparatus will furnish results in from 7 to 14 minutes, depending upon the material under examination, which are practically identical with

those obtained by drying at 105° for 15 hours or so. A scale devised by the author for rapid weighing is also illustrated and described.

The determination of sugar in natural substances, C. NEURKE and M. ISHIDA (*Biochem. Ztschr.*, 37 (1911), No. 1-2, pp. 142-169; *abst. in Zentbl. Physiol.*, 25 (1911), No. 25, pp. 1199, 1200).—The polarimetric determination of sugar in all cases is connected with a certain amount of error where optically active substances (cleavage products), such as peptone, amido acids, amins, etc., are present, as they are as a rule in human foodstuffs, but if the solution containing them is first treated with mercuric acetate and then with phosphotungstic acid interfering substances will be removed. The author first adds a 50 per cent solution in water of mercuric acetate until no more precipitation takes place, filters off the sediment, and then adds a 25 per cent aqueous solution of phosphotungstic acid until no more precipitation occurs. Care must be taken not to add a large excess of mercuric acetate. No sugar is retained in the precipitate, and that in the filtered fluid may be determined by either the reduction or the polarimetric method.

In regard to the composition of Fehling's solution as used at the present time, O. LÜNING (*Chem. Ztg.*, 36 (1912), No. 14, p. 121).—Attention is drawn to certain inaccuracies in several of the published directions for preparing Fehling's solution.

The amount of formic acid in honey, H. FINCKE (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 23 (1912), No. 6, pp. 255-267; *abst. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 8, p. 402).—Continuing previous work (E. S. R., 26, p. 312), honey was not always found to contain formic acid, but most of that examined contained a volatile acid which reduced mercuric chlorid in amounts varying from 0.003 to 0.02 per cent when calculated as formic acid. This acid was present in both the free and combined state. Esters of formic acid could not be detected.

Attention is called to the fact that small quantities of formic acid are obtained if invert sugar is distilled with steam, the quantity depending upon the acidity of the solution. Sucrose when inverted with invertase does not yield formic acid on distillation. honeys free from formic acid were not found to yield any more volatile acids than those derived from a corresponding amount of invert sugar.

The analysis of vinegar, J. H. PATERSON (*Proc. Univ. Durham Phil. Soc.*, 4 (1911-12), No. 3, pp. 144-146).—Normal vinegar contains acetic acid, and small quantities of sodium tartrate and acetate. If the acetic acid is titrated with a standard alkali solution, and the solution then titrated back with a standard acid solution, using methyl orange as an indicator, the amount of acid will be, therefore, a little in excess of that which would be equivalent to the free acid found by the alkali titration. Vinegar adulterated with mineral acid will not contain tartrates and acetates, but free acetic and tartaric acids will be present.

The method used is as follows: "A sample of the vinegar is boiled under a reflux condenser with about $\frac{1}{2}$ of its weight of animal charcoal (the charcoal is previously treated with dilute hydrochloric acid to remove all carbonates, well washed, and dried for some time at 110° C.). The liquid is then filtered and the interior of the condenser washed into the filtrate with some of the filtered liquor. About 20 gm. of the filtrate are then weighed out and diluted to 100 cc. with distilled water. Portions of 25 cc. are carefully titrated with tenth-normal caustic potash, using phenolphthalein as indicator. The solution thus obtained is diluted to a known volume (about 100 cc.), and 6 drops of methyl orange added. Decinormal sulphuric acid is then run in until a pink color without any yellow shade is produced."

A blank of distilled water is then titrated in the same way, and the true volume of acid required for the back-titration of the sodium acetate obtained by difference. Solutions containing known amounts of acetic acid, sodium acetate, and sulphuric acid were analyzed by this method.

Analysis of paprika. A. DE SIGMOND and M. VUK (*Kisérlet. Közlem.*, 14 (1911), No. 5, pp. 757-792).—The determination of the iodine number and the refraction of the ether extract will not detect adulterations of paprika with foreign oils. The standards of the United States require that paprika represent only the dried fruit of *Capsicum annuum*, while in Hungary the seeds are not excluded. As the seeds contain more oil, the United States standard of 15 per cent is exceeded.

Air-dried paprika contains more or less moisture, so that the results obtained should be compared on a dry basis. The results obtained by drying in a current of air differ markedly from those after drying in a current of illuminating gas. It is stated that Hungarian paprika can not be distinguished from foreign paprikas on the basis of a chemical examination.

Contribution to the detection of benzoic acid in foods and condiments. E. POLENSKE (*Arb. K. Gendhtsamt.*, 38 (1911), No. 2, pp. 149-154).—The author has elaborated a method for determining the total benzoic acid in red bilberries and in bilberry compote, and presents a method for the isolation and qualitative detection of benzoic acid in food products.

Determination of the total solids in milk. A. SPLITTGERBER (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 22 (1911), No. 10, pp. 583-599; *abs. in Chem. Zentbl.*, 1912, I, No. 5, pp. 377, 378; *Jour. Soc. Chem. Indus.*, 31 (1912), No. 1, pp. 40, 41).—What is deemed the most appropriate method for determining the total solids in milk consists in drying from 3 to 4 gm. of milk in a flat-bottomed dish with or without the addition of acetone or alcohol. The method yields results with normal, rich, skim, and watered milk, which compare well with the figures obtained by Fleischmann's formula. The ordinary water oven requires 1 hour for the process, while the Soxhlet oven needs only 30 minutes when a watery solution of glycerin (55 per cent) is used. The addition of 3 drops of acetic acid or formaldehyde to the milk before evaporation yields results which are too high. Old milks yield low results. "If the milk contains calcium succrate or sodium carbonate, the quantity of total solids found by direct determination is unreliable, but in such cases the calculated figure may be relied on as trustworthy."

The chlorin content of milk. P. POETSCHKE (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 1, pp. 38-40).—The chlorin determinations recorded were made by the author's method, which consists in removal of the fat and proteids with copper sulphate and sodium hydroxid. The filtrate is acidified with nitric acid and titrated by Volhard's method. Total solids were determined with the aid of a special pipette (E. S. R., 26, p. 806) devised to deliver 5 gm. of milk.

The average amount of chlorin found, expressed as sodium chlorid, was 0.17 per cent, and ranged from 0.112 to 0.335 per cent. The average ratio of sodium chlorid to ash was 1:4.5.

Titration of the milk directly for its chlorin content, as recommended by Richmond, gave erroneous results. Formaldehyde present to the extent of 1:500 in milk did not influence the results obtained with the author's method.

A rapid means for determining the fat in milk according to the Rösse-Gottlieb method. E. RUPP and A. MÜLLER (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 23 (1912), No. 7, pp. 338, 339).—The author found that the separation of the ether can be accelerated by adding gum tragacanth to the mixture and shaking.

The detection of coconut fat in butter and lard, E. POLENSKE (*Arch. K. Gendtsamt.*, 38 (1911), No. 3, pp. 402-414).—It appears that the method of Ewers (*E. S. R.*, 23, p. 417) and Fendler (*E. S. R.*, 23, p. 418) can not be used for this purpose. The Polenske method, on the other hand, will give trustworthy results. The results of examining 34 fresh and 8 old butters are given in detail.

Determination of fat in feeds by extracting in the cold, C. GRIMME (*Chem. Rev. Fett u. Harz Indus.*, 19 (1912), No. 1, pp. 1-5).—As considerable danger from fire exists when using ether for extracting fats, tests were conducted with chloroform, carbon tetrachlorid, and di-, tri-, and per-chlorethylene, for determining their value as fat solvents for air-dry cotton-seed meal.

Carbon tetrachlorid and tri-chlorethylene were the only reagents which gave results comparing well with those obtained with ether. The method finally adopted was as follows: Ten gm. of the air-dry sample is shaken with 100 cc. of either carbon tetrachlorid or tri-chlorethylene for $\frac{1}{2}$ hour in a 150 cc. flask in the cold and with the aid of the shaking machine. After allowing the insoluble particles to settle for 30 minutes, 50 cc. of the filtered fat solution is freed from the solvent by distillation and then dried for about 1 hour (by occasionally blowing air over it) at a temperature of 105° C. Multiplying by 20 the figures obtained gives the percentage of fat in the feed, providing the material did not contain more than 10 per cent of fat. If more fat is present corrections should be applied, viz, for 15 per cent fat $+0.2$ per cent, and for 20 per cent fat $+0.4$ per cent. The method gave good results with cotton-seed meal, peanut cake, peanut meal, rape cake, sunflower cake, coconut cake, soy-bean meal, linseed meal, bran, rice-feed meal, fish meal, corn meal, wheat germs, and rye bran.

Grading rosin at the still, F. P. VEITCH and C. F. SAMMET (*U. S. Dept. Agr. Bur. Chem. Circ.* 100, pp. 4, fig. 1).—A method is proposed whereby a producer can grade rosin at the still when it is made and which does away with the cutting of rosin samples. The method consists of pouring the liquefied rosin with an ordinary tin dipper into a mold made of ordinary roofing tin. When cool the samples can be compared with a set of standard types of rosin.

"By far too much low-grade rosin is being made. There are three chief causes for this: First, the presence in the gum in the still of considerable quantities of wood, bark, pine needles, charcoal, and dirt which, through carelessness, accident, or both, have gotten into the gum in the woods and the larger part of which remains in the still during distillation. . . . Second, excessive heating or prolonged heating of the rosin in the still at the close of distillation, largely for the purpose of removing all turpentine and water which it may contain. Third, the presence in the finished rosin of much finely divided foreign material, such as charcoal and earth mentioned above, due to faulty straining of the finished rosin. . . . Rosins which had been graded A, B, C, D, and E, when dissolved in turpentine or alcohol, carefully strained, and the solvent evaporated with heat, all grade higher, many of them F or better, thus showing that these rosins were graded low because of the foreign material they contained, which had not been removed in straining, rather than because of the color of the rosin itself."

Oil from plants belonging to the order Papilionaceæ, C. GRIMME (*Pharm. Zentralhalle*, 52 (1911), No. 48, pp. 1141-1149; *abs. in Chem. Zentbl.*, 1911, II, No. 23, pp. 1739, 1740; *Jour. Soc. Chem. Indus.*, 30 (1911), No. 24, p. 1460).—The following seeds were examined for their oil content: *Cicer arietinum*, *Pisum sativum*, *Vicia faba*, *V. sativa*, *V. sepium*, *Lens esculenta*, *Cajanus*

indicus, *Phaseolus mungo*, *P. vulgaris albus*, *P. coccineus*, *P. lunatus*, *P. manihoti*, *Dolichos lablab*, *Vigna catjang*, *Canavalia ensiformis*, and *Voandzeia subterranea*. Physical and chemical constants are reported, and the fatty acids were also studied. All the oils were nondrying in character.

Heat of combustion of bagasse from Hawaiian cane, R. S. NORRIS (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 40, pp. 5-23*).—Using an Atwater modification of the Berthelot bomb, the thermal value of fiber from leading varieties of Hawaiian cane was determined, primarily for the purpose of ascertaining whether the variation in the amount of steam obtained in factories when different kinds of cane are being ground is due to the thermal value of the bagasse used for firing.

"The results are practically the same as those obtained for the thermal value of cane fiber in other countries as [summarized] and show conclusively that the variation in the steam when different kinds of cane are being ground is not due to differences in the thermal value of the bagasse. The maximum thermal value found was 4,636 calories (8,334 B. T. U.) and the minimum 4,494 calories (8,089 B. T. U.)—a difference of only 3 per cent."

The 2 standard varieties of cane grown on the islands, Lahaina and Caledonia, were found to have high thermal values. The average thermal value of cane fiber grown at the station and on Hawaiian plantations was 4,600 calories, which is 100 calories more per kilogram than for the bagasse therefrom.

The carbon and hydrogen contents, respectively, were for the bagasse 48.13 and 5.63 per cent; for the fiber 48.9 and 6 per cent; for the rind fiber 48.75 and 5.35 per cent; and for the pith fiber 47.2 and 5.9 per cent. "The rind fiber was about 4 per cent higher in thermal value than the pith fiber. This would tend toward giving canes with stalks of small diameter a higher value than those with large stalks, but an examination of the results shows that this influence is overcome by other variations in the cane." The thermal value of fiber from nodes was found to be $1\frac{1}{2}$ per cent higher than that from the internodes in the 2 standard varieties of cane in Hawaii.

On the basis of the values recorded the fuel values of various bagasses may be compared with one another, and bagasse with other fuels. Some figures for the thermal value of subsidiary fuels in cane sugar factories are also included.

A bibliography on bagasse as fuel is appended.

Sisal and the utilization of sisal waste, E. V. WILCOX and W. McGEORGE (*Hawaii Sta. Press Bul. 35, pp. 24*).—Continuing previous work (E. S. R., 15, p. 244), the conditions of the sisal industry in Hawaii were reviewed, and a chemical study of sisal and henequen was made for the purpose of finding a means of utilizing the residue after decortication as a fertilizer, stock food, or as a source of industrial alcohol.

The nitrogen content of 6 samples of waste was found to vary between 0.45 and 1.35 per cent; potash from 0.69 to 6.38 per cent; phosphoric acid from 0.46 to 2.79 per cent. Ash analyses of the leaves showed that "the plant feeds most heavily upon phosphates, lime, magnesia, potash, and soda, and since nearly all its mineral matter remains in the waste the analyses strongly indicate the advisability of returning the waste to the soil as fertilizer."

To use it as a stock food also seems possible, although it is first necessary to bring it to a dry condition. Converted into an air-dry form the minimum figures obtained were moisture 5 per cent, protein 5.73 per cent, nitrogen-free extract 60.01 per cent, fiber 17.97 per cent, and ash 11.24 per cent.

The chemical composition of the sisal leaf was as follows:

Chemical composition of sisal leaves, calculated on a dry basis.

Constituent.	Sample numbers.					
	1	2	3	4	5	6
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Reducing sugars.....	12.49	18.68	10.45	20.03	7.48	18.50
Nonreducing sugars.....	5.58	17.32	27.77	7.66	7.33	3.80
Gums.....	35.14	15.67	23.48	23.72	34.68	38.51
Starch.....	.60	2.57	.68	1.80	.64	1.25
Pentosans.....	2.32	4.92	3.96	4.73	5.95	4.48
Nitrogenous matter.....	7.25	4.75	4.89	6.00	3.68	4.19
Resin.....	2.82	.83	1.84	1.53	1.67	1.12
Fiber.....	20.86	23.13	15.80	23.71	26.49	18.12
Ash (total).....	14.42	8.63	9.16	9.14	11.83	14.76
Acidity.....			3.48	3.94	1.56	

The sugars soluble in cold water were in every instance found to be apparently insoluble in alcohol. The sum of the water and alcohol-soluble substances were a fairly constant quantity in most cases. When the sugar content of fresh sisal leaves was high the percentage of gum was low. After such leaves were left in the laboratory for a month a considerable reduction of the total sugar content (from 36 to 12.14 per cent) and an increase in the gum content (from 15.67 to 39.53 per cent) took place.

The acid present in sisal was found to be lactic and the authors were not able to obtain a test for oxalic acid after boiling the leaves vigorously in water, but a faint test was obtained after boiling in a hydrochloric acid solution. Short leaves were found to possess a higher percentage of acid than longer ones.

"The sugar content of the fresh leaf varied from 2 to 7 per cent, making an average of 4.5 per cent, which theoretically would yield about 23 liters (or 6.5 gallons) absolute alcohol per ton of leaves. It is hardly conceivable that with such a sugar content this could be made a remunerative industry with the waste at hand."

Report in regard to the activities of the Pommritz Agricultural-Chemical Experiment Station, 1911, *LOCES (Ber. Agr. Chem. Vers. Stat. Pommritz, 1911, pp. 8)*.—This is the report of the activities of this station for the year 1911, including among other data analyses of dairy products, fertilizers, feeding stuffs, and miscellaneous materials.

International catalogue of scientific literature, D—Chemistry (*Internat. Cat. Sci. Lit.*, 9 (1912), pp. VII+960).—The literature indexed in this publication (*E. S. R.*, 24, p. 408) is mainly that published in the year 1909, but includes some articles from 1901 to 1908 which were received too late for insertion in previous volumes, and also some entries dated 1910.

METEOROLOGY—WATER.

The correlation between sunspots and the weather, A. GÖCKEL (*Sol. Amer. Sup.*, 74 (1912), No. 1911, pp. 102, 103).—The scientific evidence bearing on such correlation is reviewed. The correlation between sunspots and rain and between sunspots and terrestrial magnetism is considered to be established. It is also stated that the frequency of cyclones increases with the number of sunspots.

[Weather observations], M. A. BLAKE, B. D. HALSTED ET AL. (*New Jersey Stat. Rpt. 1910, pp. 81-86, 272-276*).—Observations on temperature, precipitation,

rain, and evaporation at New Brunswick during 1910 and previous years are reported and briefly discussed.

Weather report, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 37 (1911), pp. 53-63).—Tabular summaries are given of observations on temperature, precipitation, and length of the growing season at representative stations in Ontario during 1911. There is also a record of wind movement during the year at Guelph.

Swedish meteorological observations, 1911, H. E. HAMBERG (*Met. Iakttag. Sverige (Observ. Mët. Suéd.) K. Svenska Vetensk. Akad.*, 53 (1911), pp. 1-157).—These are the usual meteorological summaries of observations made under the direction of the Central Meteorological Institute of Sweden.

Duration of sunshine and insolation at Stockholm and Häfringe, J. WESTMAN (*K. Svenska Vetensk. Akad. Handl.*, 47 (1911), No. 8, pp. 38; *abs. in Met. Ztschr.*, 29 (1912), No. 10, pp. 439, 499).—Monthly and yearly sums of sunshine, total radiation, and vertical components of total radiation are given for Stockholm during 1907 to 1910 and for Häfringe for 1910.

Frosts in New York, W. M. WILSON (*New York Cornell Sta. Bul.* 316, pp. 565-568, figs. 18).—Conditions favoring the formation of frost and methods of protection which have been used with success are described with special reference to conditions prevailing in New York.

Electric Niagaras and recent storms, A. LAFOREST (*Jour. Soc. Nat. Hort. France*, 4. sér., 13 (1912), Sept., pp. 572-574).—Several instances are cited in which the Eiffel Tower, acting as a so-called electric Niagara, had no influence in dissipating hail storms.

Well water, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 37 (1911), pp. 71-73).—Sanitary analyses of 34 samples of well water from different parts of Ontario are reported. A large proportion of the samples showed evidence of contamination.

SOILS—FERTILIZERS.

The soils of Oregon, C. E. BRADLEY (*Oregon Sta. Bul.* 112, pp. 48).—This bulletin reports the results of several years' work on the soils of Oregon and includes chemical analyses of a number of soil types from different parts of the State arranged by counties, and analyses of drainage waters from tanks under different cropping systems and fertilizers. Analyses of samples of water from the Columbia and the Willamette rivers are also reported.

"The soils grade from the rich black loams of the coastal plains and lower river courses of western Oregon to the extremely sandy soils of the eastern and the coarse granitic soils of the southern portion of the State, with many intermediate types. Volcanic rocks predominate in the northwest, and Oregon soils are largely derived from weathered basalt, diabase, and diorite, particularly in the eastern and western part of the State. In southern Oregon granites, limestones, and other metamorphic rock exist also and have, therefore, determined in part the mineral character of the soils of this section. Where the weathering process has taken place under humid conditions, as in western Oregon, clay loams rich in humus have been formed, while under the climatic influences of the arid or semiarid conditions of that portion of the State east of the Cascade range, a sandy soil has resulted."

It was found that there was little loss of the mineral elements by leaching, except in one case where considerable phosphoric acid was lost. Nitrogen was lost in appreciable quantities, particularly under summer fallow. This nitrogen loss was appreciably reduced by legume rotations.

It was found that, although the percentage of nitrogen remained practically constant under continued cropping for, in extreme cases, 25 years, there was a marked decrease in the carbon content.

"The loss of humus from these soils under the wheat-fallow system is a matter of serious import, and it would seem that methods for conserving this organic matter must be adopted if these soils are to maintain their productive-ness."

Sandy soils of western and northern Michigan, J. A. JEFFREY (*Michigan Sta. Circ. 16, pp. 101-105*).—These soils range from the coarser dune sands, which possess little or no agricultural value, to the finer Miami sands.

"The Miami sands vary from soils that possess much intrinsic agricultural value to soils that can never be made profitably productive under ordinary methods of management." The possible cropping value is indicated by the original vegetation which the soils are supporting or have supported. Potatoes, clover, rye, buckwheat, and in some cases wheat, oats, and barley are the crops best suited to the soils. "Truck crops do well, corn and beans do fairly well. Alfalfa promises to prove a very valuable crop for these soils. They are not adapted to the growing of sugar beets."

Results of chemical studies of the cane soils of Java, T. MARR (*Arch. Suikerindus. Nederland. Indië, 20 (1912), No. 32, pp. 1251-1311, pls. 11, fig. 1; Meded. Proefstat. Java-Suikerindus., 1912, No. 23, pp. 653-714, pls. 41, fig. 1*).—This is a compilation of physical and chemical analyses, made by different investigators during the last 25 years, of a large number of samples of cane soils from various districts of Java. See also a note by Mohr (*E. S. R., 25, p. 512*). The report includes a discussion of the topographical features of the various districts, the character and distribution of the soil types, and the amount of plant-food constituents of the soils.

Soil mapping and geological-agronomic maps, W. KOEHNE (*Landw. Heft, 1912, No. 5, pp. 32*).—This is a general discussion of the scope and purpose of geological-agronomic soil maps, with particular reference to their practical value and interpretation by the farmer.

The Mangum terrace in its relation to efficient farm management, J. S. CATES (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 94, pp. 11, figs. 9*).—The advantages and construction of the Mangum terrace worked out by P. H. Mangum of Wake Forest, N. C., are briefly described. It is a broad bank of earth contouring the field at a grade of approximately 1½ in. to 14 ft. Under ordinary farm conditions, the most practical way of constructing the terrace is by back furrowing along the grade line.

The advantages of this system are stated to be its adaptation to all types of soil, especially to moderately rolling lands, the possibility of using extensive cultivation machinery and cultivating across the terrace, the saving of labor and land, and the ease of preserving the terrace when once constructed.

Bacteriological studies of field soils.—I, The effects of lime, P. E. BROWN (*Iowa Sta. Research Bul. 5, pp. 189-210*).—Previous experiments (*E. S. R., 26, p. 423*) having dealt with the effects of ground limestone on certain groups of soil bacteria under greenhouse conditions, similar experiments were conducted under field conditions. The results of the work in general were similar to those already noted.

Bacteriological studies of field soils.—I, The effects of liming, P. E. BROWN (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 11-13, pp. 234-248*).—This is an abridged account of investigations noted above.

Bacterial activities in frozen soils, P. E. BROWN and R. E. SMITH (*Iowa Sta. Research Bul. 4, pp. 157-184; Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 14-17*).

pp. 369-385).—This is a detailed account of investigations which have already been noted from a briefer paper (E. S. R., 26, p. 816).

Relations of the plant to the nutritive elements of the soil: The law of minimum and the law of physiological ratios, P. MAZÉ (*Compt. Rend. Acad. Sci. (Paris)*, 154 (1912), No. 25, pp. 1711-1717, fig. 1; *abs. in Rev. Gén. Agron.*, n. ser., 7 (1912), No. 8, pp. 292-295; *Jour. Soc. Chem. Indus.*, 31 (1912), No. 14, p. 695).—The author's experiments with maize and *Aspergillus niger*, using various kinds, amounts, and relative proportions of mineral substances in the culture solutions, led to the conclusion that the law of minimum, particularly as defined by Mitscherlich (E. S. R., 25, p. 825) is a purely speculative conception. The relation of the plant to its nutritive substratum is determined by complex conditions controlled by a law which is designated the law of physiological ratios, that is, the growth of the plant is determined not solely by the nutritive constituent present in minimum amount but by the concentration and relative proportions of the constituents in the nutritive medium.

The law of minimum, E. A. MITSCHERLICH, T. PFRIFFER, and O. FRÖHLICH (*Länderwirts. Stat.*, 77 (1912), No. 5-6, pp. 413-439, figs. 4).—This is a series of three controversial articles on this subject. See above.

Experiments on ammonia and nitrate formation in soils, J. G. LIPMAN, P. E. BROWN, and I. L. OWEN (*New Jersey Stat. Rpt.* 1910, pp. 89-124).—In continuation of previous investigations (E. S. R., 25, p. 423) experiments were made to test further the accuracy of the method used and "to accumulate data on the decomposition of protein compounds in the soil." The experiments here reported dealt with the effect of mechanical composition of the soil, moisture conditions, lime, and various physical and chemical factors on the formation of ammonia in soils. The results obtained in a series of experiments uniformly indicated a high degree of accuracy for the method.

Varying the proportion of sand in the soil had little effect on the formation of ammonia from dried blood, but affected to a marked degree ammonia accumulation, the latter declining as the proportion of sand increased. In pot experiments it was found that addition of sand to soil increased the availability of nitrogen as measured by the nitrogen content of the crop.

"The influence of the increasing amounts of moisture in the soil is apparent, on the one hand, in the increasing yields of dry matter and, on the other, in the decreasing proportion of nitrogen in the latter. The average yield of dry matter gradually rose from 13 gm. to 20.75 gm., but when the proportion of water in the soil mixture was increased from 13 to 15 per cent the yield of dry matter was somewhat decreased. The proportion of nitrogen in the dry matter was highest when the soil mixture contained only 5 per cent of moisture. It was least when the soil mixture contained 15 per cent of moisture. Similarly, the yields of total nitrogen increased from 266.86 to 292.47 mg. when the moisture content in the soil rose from 7 to 9 per cent. Further additions of moisture were followed by corresponding increases, the maximum yield being attained in the soil mixtures containing 13 per cent of water. After that there was a small reduction in the yield of nitrogen."

"The decomposition of organic matter in the soil was favored or retarded by additions of magnesian and nonmagnesian lime according to the character of the organic matter." In experiments with a commercial carbonate of lime containing 2 per cent of boron the latter proved injurious to higher plants and to decay bacteria in the soil.

Wide variations were found in the ammonia formation in soils from different sources.

The addition of monocalcic and dicalcic phosphates to soil greatly increased ammonia formation. Tricalcic phosphate was without effect. "It seems, there-

fore, that the monocalcic and dicalcic phosphate were equally effective in stimulating the activities of the decay bacteria."

It was found "that with a proper supply of lime peat may become a very satisfactory medium for the development of ammonifying bacteria."

The influence of an addition of sugar on the productivity of soils, T. PFEIFFER and E. BLANCK (*Mitt. Landw. Inst. Breslau*, 6 (1912), No. 4, pp. 601-612, fig. 1).—The authors briefly review the work on this subject by A. Koch, Lemmermann et al., and Schneldewind et al. (*E. S. R.*, 20, p. 47; 24, p. 327; 26, p. 319), and report a continuation of studies (*E. S. R.*, 24, p. 319) of the effect of sugar with and without phosphoric acid on the nitrogen supply of different soil plots, as measured by yield of oats and turnips, using 1 kg. of sugar and 100 gm. of Thomas meal per square meter.

The results showed a slightly injurious effect of the sugar on the yield of the oat crop. The after effects of the sugar on the turnips were apparently slightly beneficial. It is believed, therefore, that the importance of the fertilizing effect of sugar or organic substances has been overrated. Further studies with sugar in combination with potash and phosphatic fertilizers are being made.

On the action of an addition of alumina gel to the soil on the assimilation of phosphoric acid by the plants, T. PFEIFFER and E. BLANCK (*Mitt. Landw. Inst. Breslau*, 6 (1912), No. 4, pp. 613-617).—This is a continuation of previous work (*E. S. R.*, 25, p. 121), and reports studies of the effect of alumina on the assimilation of phosphoric acid by yellow lupines, using 390 gm. of aluminium hydroxid, containing 2.1 per cent Al_2O_3 , per 18 kg. of sand in pots fertilized with potassium phosphate.

The results, in general, confirmed those of the previous experiments and indicated that the phosphoric acid did not go into absorptive but into chemical combination.

Brief reference is also made to a study of the lime intolerance of lupines. It was found that the iron content was lower for plants grown on a soil rich in calcium carbonate. The potash content of the plants was not reduced by addition of lime to the soil.

The effect of heating and antiseptic treatment on the solubility of fertilizing ingredients in soils, H. I. JENSEN (*Jour. and Proc. Roy. Soc. N. S. Wales*, 45 (1911), pt. 2, pp. 169-175).—Previous investigations bearing on this subject by Russell and Hutchinson (*E. S. R.*, 22, p. 121), Pickering (*E. S. R.*, 24, p. 420), Fraps (*E. S. R.*, 26, p. 726), and Greig-Smith (*E. S. R.*, 25, p. 214) are briefly referred to, and studies of the solubility in strong hydrochloric acid, 1 per cent citric acid, and fifth-normal nitric acid of the fertilizing constituents in 6 soils untreated and (presumably) sterilized by heat are reported.

The results obtained indicate that the treatment (?) made no appreciable difference in the solubility of the mineral fertilizing ingredients in acids and fail to support Greig-Smith's theory of waterproofing the soil particles by aggricere. The evidence is therefore decidedly in favor of the view taken by Russell and Hutchinson, that the increased fertility is due to the destruction of the protozoa and nitric acid-producing bacteria and a quick revival of the ammonia-forming bacterial flora."

Influence of the micro-organisms carried to the soil by night soil on the fertilizing effect of the same, G. MASONI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 3, pp. 191-223; *abs. in Chem. Zentrbl.*, 1912, I, No. 20, p. 1685).—In pot tests with unmanured soil, that receiving untreated night soil, and that receiving night soil sterilized by heat, sulphuric acid (1 per cent), and sodium sulphate (equivalent to 1 per cent sulphuric acid), the yields were as a rule greater

with sterilized than with untreated night soil on both normal and sterilized soil.

Report of Leteensuo Moor Experiment Station, 1912, E. F. SIMOLA (*Finska Mosskulturför. Årsbok*, 16 (1912), No. 1, pp. 92-116, figs. 9).—A description is given of the station and its equipment, and brief mention is made of the fertilizer trials and other experiments in progress.

Report of the South Oesterbotten Moor Experiment Station, 1912, A. E. RAUMAKOSKI (*Finska Mosskulturför. Årsbok*, 16 (1912), No. 1, pp. 117-147, figs. 10).—A report similar to that of the Leteensuo Moor Experiment Station referred to above.

The nitrate of soda industry of Chile, B. D. OSSA (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 2 (1912), Sect. II, pp. 187-204, figs. 10).—This article contains substantially the same information given in a previous article which has already been noted (E. S. R., 24, p. 526).

The author concludes that the Chilean nitrate deposits are capable of furnishing all of the nitrogen required by the world for a century. The technique of the industry is being developed and improved so that the price of nitrogen in nitrate of soda can be still further reduced.

The use of nitrate of soda in commercial fertilizers, C. S. CATHCART (*New Jersey Stas. Rpt.* 1910, pp. 41-48).—The essential features of this article have been noted from another source (E. S. R., 25, p. 120).

The availability of nitrogenous materials as measured by ammonification, J. G. LIPMAN, P. E. BROWN, and I. L. OWEN (*New Jersey Stas. Rpt.* 1910, pp. 127-132).—The availability of nitrogen in dried blood, tankage, ground fish, corn meal, rice, wheat, and rye flours, cotton-seed meal, linseed meal, cowpea meal, and soy-bean meal was measured by vegetation experiments and determined by ammonia formation under different conditions by the following method:

"A large quantity of air-dry, silt loam was sifted and thoroughly mixed so as to furnish a uniform medium for bacterial growth. One hundred gm. quantities of this soil were placed in tumblers, the nitrogenous material was added and carefully mixed with the soil, and the latter was then moistened with a quantity of water or fresh soil infusion, sufficient to establish optimum moisture conditions. The tumblers were covered with Petri dish covers and kept in the incubator at 27° C. for a definite period. Subsequently the different soil portions were transferred to copper flasks, about 200 cc. of water and magnesia were added, and the ammonia was distilled off and titrated against standard hydrochloric acid."

The availability of the nitrogen of the vegetable substances was also determined by their rate of nitrification. In general the results of the nitrification experiments were in agreement with those of the ammonification experiments. "Both methods distinguished between available and unavailable nitrogen compounds in so far as the micro-organisms as well as the higher plants are concerned. They possess, therefore, a direct value for both experimental and control work."

In experiments with combinations of peat and dried blood it was found that "the nitrogen compounds in the peat were so inert as to be scarcely affected in their decomposition by the presence of readily assimilable nitrogen compounds. On the other hand, the latter were unfavorably affected by the peat for they furnished less nitrogen to the plants when the peat was mixed with them."

The method was found to be applicable to the determination of the availability of nitrogen in mixed substances and complete fertilizers.

Experiments with new nitrogenous fertilizers, 1908-1911, S. RIBBON (K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 5, pp. 382-382).—These experiments were a continuation of an investigation by the author commenced in 1908 (E. S. R., 19, p. 220). The effects of fertilization with Norwegian nitrate, sodium nitrate, ammonium sulphate, and cyanamid in connection with other fertilizers were compared on small grains, grass land, potatoes, and mangels.

It was found, as the average for all trials conducted, that the fertilizing effect of cyanamid measured by the increase in the value of the crops raised was from 68 to 70 per cent of that of sodium nitrate and similar to ammonium sulphate, that of Norwegian nitrate being 96 per cent. The experiments, in general, point to the value of cyanamid for the Swedish farmer. While many questions relating to its effects and best methods of application still have to be studied, the results obtained suggest that this fertilizer may prove of great economic value to Sweden as it will tend to make the farmer independent of imported nitrogenous fertilizers.

Destruction of wild mustard by means of lime nitrogen, H. LIPSCHUTZ (Deut. Landw. Presse, 39 (1912), No. 68, p. 784, figs. 3).—To oats, which had been seeded on March 27 and which contained a large admixture of wild mustard, lime nitrogen was applied about the end of April at the rate of about 160 lbs. per acre in the early morning when the dew was on. This application produced some temporary injury to the oats, which was soon overcome, but almost completely destroyed the wild mustard.

Seaweed, potash, and iodine: A criticism, H. KNUDSEN (Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 623, 624).—This is a criticism of certain conclusions by Cameron (E. S. R., 27, p. 22) regarding the value of Pacific coast seaweed as a source of potash. It is maintained that "a potash industry on the basis of seaweed will first and last depend on the content of iodine in the marine plants," and that "as yet we possess very little of value and very little authentic information to solve the question: 'Is it possible to build up a lucrative industry on the abundant growth of seaweed at the Pacific coast?'"

The extraction of potash and alumina from feldspar, H. W. FOOTE and S. R. SCHOLES (Jour. Indus. and Engin. Chem., 4 (1912), No. 5, p. 577; Chem. News, 106 (1912), No. 2753, p. 106).—Experiments are reported which show that almost complete decomposition of feldspar can be secured by heating it to a temperature well above 100° C. under pressure with hydrofluoric acid, which seems to act in this case as a catalytic agent.

The production of available potash from the natural silicates, A. S. CUSHMAN and G. W. COGGESHALL (Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 5 (1912), Sect. IIIc, pp. 33-49; Jour. Indus. and Engin. Chem., 4 (1912), No. 11, pp. 821-827).—The various processes which have been proposed for this purpose are reviewed, particular attention being given to a process devised by the authors in which lime and salt or calcium chlorid are used as the reducing agents in a new rotary kiln.

This process depends upon a previous treatment before furnacing, consisting of a method of aggregating or clumping the mix so that chemical contact of the reacting substances is brought about during the subsequent processing. The qualitative and quantitative results obtained on a number of experimental trials on a mill scale of operation are presented and discussed. It is shown that it is possible to economically manufacture a potash fertilizer containing free lime from feldspar and for a sufficiently low cost to make an industry based upon the method, worthy of consideration.

Pot experiments with different potash minerals, D. N. PRYANIN (Landw. Vers. Stas., 77 (1912), No. 5-6, pp. 399-411, pls. 5; abstr. in Jour. Soc.

Chem. Abstr., 31 (1912), No. 20, p. 1000).—In continuation of previous experiments (*ibid.*, 26, p. 425) the author made comparative tests on a variety of crops of nepheline, muscovite, biotite, leucite, apophyllite, phillipsite, sandline, microcline, eläolith, and mica schist.

The results show in general that while some of the aluminosilicates are markedly good sources of potash, others are worthless for this purpose. The feldspar group is a poor source of potash for plants. The minerals tested appeared to stand in the following order as regards availability of potash: Nepheline, mica, biotite, phillipsite, muscovite, eläolith, leucite, apophyllite, sandline, microcline, microcline. This was practically the order indicated by the solubility of the potash of the minerals in neutral salts (ammonium and barium chlorides).

To what extent can the potash of fine-ground feldspar be utilized by plants on moor soils? H. von FEILITZEN (*Ernähr. Pflanze*, 8 (1912), No. 19, pp. 225-232, figs. 6).—The results of the experiments here reported, which extended over a series of years, indicated as a rule very little effect from the potash of feldspar as compared with that of potash salts.

Comparative tests of phonolite, 40 per cent potassium salts, and kainit, M. ÖRME (*Deut. Landw. Presse*, 39 (1912), No. 64, pp. 740, 741).—Plat experiments on moor meadows during 1910 and 1911 indicated no beneficial results from applications of phonolite, whereas the 40 per cent potassium salts and kainit gave excellent returns.

Thomas phosphate meal, D. J. HISSINK (*Cultura*, 24 (1912), No. 288, pp. 315-317).—The requirements of the fertilizer law, as regards the composition, solubility, and physical constitution of Thomas meal as sold on the market in the Netherlands, are stated and briefly explained.

The agricultural value of electric slag, M. DE MOLINARI and O. LIGOT (*Ann. Gembloux*, 22 (1912), No. 10, pp. 567-572, figs. 2; *abs. in Engrais*, 27 (1912), No. 41, pp. 1138, 1139).—A brief account is given of pot experiments with oats on sand and soil to determine the relative fertilizing value of ordinary Thomas slag and slag made by a new electric process. The Thomas slag used contained 21.81 per cent of phosphoric acid soluble in mineral acids and 20.94 per cent soluble in 2 per cent citric acid. The two electric slags used contained, respectively, 5.12 and 6.76 per cent of phosphoric acid soluble in mineral acids and 1.56 and 1.38 per cent soluble in 2 per cent citric acid.

The results showed that on the basis of total phosphoric acid the electric slag gave results inferior to those obtained with Thomas slag. On the basis of phosphoric acid soluble in 2 per cent citric acid the results were about the same.

The assimilation of phosphatic fertilizers in the course of a rotation, A. MENET and H. GAUDECHON (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 257-260; *abs. in Rev. Sci. [Paris]*, 50 (1912), II, No. 5, p. 156; *Rev. Gén. Agron.*, 4, ser. 7 (1912), No. 8, pp. 289-292; *Chem. Zentrbl.*, 1912, II, No. 15, p. 1377).—The general conclusion reached from these investigations is that it is not advisable to apply large amounts of readily assimilable phosphatic fertilizers, with the expectation that the effect of such fertilizers will be extended over several years. On the contrary, the amount of such fertilizers should be in proportion to the needs of the crops during each season.

The assimilation of phosphoric acid by plants, A. MÜLLER and H. GAUDECHON (*Ann. Sci. Agron.*, 4, ser. 1 (1912), II, No. 3, pp. 200-216; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 16, p. 787).—The rate of assimilation of phosphoric acid by maize, wheat, barley, rape, turnips, mustard, beans, peas, and lupines was determined in pot experiments with monocalcium phosphate (superphosphate), dicalcium phosphate (precipitated phosphate), and tricalcium phosphate.

The results show that assimilable phosphates become inactive in the soil the second or third year after application. Different species of plants vary in their capacity to utilize the phosphoric acid naturally present in the soil and therefore vary in the response that they make to applications of phosphatic fertilizers. The superiority shown the first year by superphosphate on account of its finer division and better distribution becomes very slight the second year and soon disappears, so that the three forms of chemically prepared phosphates used in these experiments showed about equal fertilizing values. See also the article noted above.

The effect of cow dung on the availability of rock phosphate, B. L. HARTWELL and F. R. PEMBER (*Rhode Island Sta. Bul.* 151, pp. 165-174, pl. 1).—"This bulletin contains the results of a pot experiment in which is ascertained the effect of finely ground rock phosphate, or floats, and cow feces or dung, used both singly and combined, on the growth of Japanese millet (*Panicum craxalli*) and a succeeding crop of oats.

"Previous to drying, grinding, and mixing with the soil, the fresh dung was stored for about 9 months, not only by itself, but also in an intimate mixture with floats." Portions were stored in a shallow pan, allowing free access of air. Other portions were packed in a bottle until the latter was completely filled, and stoppered so that only a small amount of air was present.

The soil used in the experiments had been limed and was deficient in phosphoric acid, but was supplied with optimum amounts of nitrogen and potash.

"The increase caused by the floats alone added to that caused by the dung alone was about equal to that obtained when both were applied together; and it made practically no difference whether the dung and floats were first brought together when they were added to the soil at the time of planting, or had been kept in a moist mixture during the previous 9 months."

The results therefore indicate that practically no increase in available phosphoric acid resulted "from mixing fresh cow dung and floats together for a number of months before applying them to the land."

The action of calcium carbonate in the fertilizing of oats with monocalcium and dicalcium phosphate, W. SIMMERMACHER (*Landw. Vers. Stat.* 77 (1912), No. 5-6, pp. 441-471, fig. 1).—"Pot experiments and chemical studies are reported which led to the conclusion that calcium carbonate does not reduce the fertilizing effect of monocalcium phosphate although it reduces the assimilation of phosphoric acid by the plant. In case of dicalcium phosphate, however, calcium carbonate strongly depressed both the yield and assimilation of phosphoric acid. The bearing of the results on the law of minimum as set forth by Mitscherlich (*E. S. R.*, 25, p. 825) is discussed.

The mechanism and fertilizing action of sulphur, E. BOULLANGER and DUGARDIN (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 327-329; *abs. in Rev. Sci. [Paris]*, 50 (1912), II, No. 5, pp. 156, 157; *Rev. Vit.*, 38 (1912), No. 976, pp. 250-252; *Chem. Zentral.*, 1912, II, No. 16, pp. 1392, 1393).—"The favorable action of flowers of sulphur is attributed to its effect on the bacteria which break down the nitrogenous matter of the soil to ammonia, and also on the nitrifying organisms. In the presence of sulphur the plant is able to obtain a large amount of directly assimilable ammonium salts. Since the ammonia is formed exclusively from the nitrogenous matter of the soil, it is necessary to add organic nitrogenous fertilizers to the soil to counterbalance the rapid removal of nitrogen by plants under such conditions.

Action of manganese oxid (MnO_2) on organic nitrogenous compounds with reference to use of the oxid as fertilizer, G. LEONCINI and C. FERRI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 3, pp. 224-244; *abs. in Chem. Zentral.*, 1912, I, No. 20, pp. 1635, 1636).—"It was found in these experiments that ammonium compounds

were not oxidized by manganese dioxide. It oxidized amides to nitric acid both in neutral and alkaline solutions at boiling temperature, but not at a temperature of 30° C. Amido acids and acid amides were not affected under these conditions. Uric acid and its derivatives xanthin and hypoxanthin were not oxidized. Only a trace of ammonia was observed. The oxid at ordinary temperatures under the conditions of this experiment did not convert organic nitrogen into nitric nitrogen.

Indigenous manures of South India and their application, W. H. HARRISON (*Dept. Agr. Madras Bul.* 65, 1912, pp. 11).—Among the manures whose composition and use are discussed in this article sunn hemp; indigo; various water weeds; oil cakes; ash of cane trash, cotton stalks, and paddy husks; indigo and rice wastes; fish fertilizers; and saltpeter; besides various animal and mineral fertilizers.

Comparative trials of hand peat-litter machines (*Finska Mosskulturför. Årsbok*, 16 (1912), No. 1, pp. 72-85, figs. 8).—Descriptions and trials of 6 peat-litter machines are given.

Fertilizer statistics, D. ZOLLA (*Rev. Gén. Sci.*, 23 (1912), No. 18, pp. 707-709).—Statistics are given of the production of nitrate of soda in Chile from 1830 to 1911; the consumption of nitrate in Europe and Egypt from 1900 to 1911, and in the United States from 1885 to 1911; the production of sulphate of ammonia in France from 1900 to 1911; the consumption of potash per unit area in different countries during 1911; the consumption of phosphates in France during 1900 to 1909; and the production of Algerian and Tunisian phosphates during 1890 to 1911.

Fertilizers, R. E. ROSE and L. HEIMBURGER (*Fla. Quart. Bul. Agr. Dept.*, 22 (1912), No. 4, pp. 157-167, 171-179).—An account is given of the fertilizer inspection during 1912, including analyses of fertilizers examined, with notes on laws and regulations and valuation of fertilizers.

Fertilizer analyses, H. B. McDONNELL ET AL. (*Id. Agr. Col. Quart.*, 1912, No. 53, pp. 40).—This bulletin gives tables showing analyses and valuations of fertilizers inspected from February to July, 1912, inclusive, and the text of the new fertilizer law, which will take effect February 1, 1913.

Inspection of commercial fertilizers, season 1911 and 1912 (*Bul. [Miss. Dept. Agr. and Com.]* 7 (1912), No. 11, pp. 1, 2).—This is a report of analyses and valuations of fertilizers examined during October, 1912.

List of fertilizer manufacturers and importers (*Penn. Dept. Agr. Bul.* 220, 1912, pp. 39).—This list gives not only names and addresses of the manufacturers and importers, but names of the "brands of their fertilizers for which license to sell in Pennsylvania during 1912 was taken out prior to February 23, 1912." The text of the State fertilizer law is also given.

The lime inspection law of Maryland (*Id. Agr. Col. Quart.*, 1912, No. 56, pp. 3, 3).—The text of this law, which went into effect June 1, 1912, is given.

AGRICULTURAL BOTANY.

Studies on fungi for beginners.—II, Microscopic fungi, G. LINDAU (*Kryptogamenflora für Anfänger. II, Mikroskopische Pilze*, Berlin, 1912, pp. VII + (24) + 276, figs. 558).—This gives directions for the microscopical study of the various groups of fungi, followed by synoptical keys and descriptions of genera and species of fungi belonging to the groups Schizomycetes to Basidiomycetes. Bacteria, yeasts, and molds in the home, H. W. CONN (*Boston, New York, Chicago, and London*, 1912, rev. ed., pp. VI + 295, figs. 83).—This is a second edition of the author's popular work, which is designed for use in connection with courses in home economics and by those engaged in household manage-

ment. The general nature of molds, yeasts, and bacteria, and the action and use of beneficial forms are described. Chapters are given on the preservation of food, use of preservatives, canning, etc., as well as on disease bacteria, disinfection, etc. Directions for laboratory experiments to be carried on in connection with courses are also given.

A laboratory guide in soil bacteriology, J. G. LIPMAN and P. R. BROWN (1911, pp. IV+87, chart 1).—This little book consists of 55 exercises on soil bacteriology, and is designed by the authors to follow courses in general bacteriology and technique. Chapters are given on the preparation of media, methods of determination, and a descriptive chart for the recording of cultural and morphological characteristics of organisms.

Fungus flora of the soil, C. N. JENSEN (New York Cornell Sta. Bul. 515, pp. 415-501, figs. 35).—This gives the results of a study of the fungus flora of the soil, made as a partial fulfillment of the requirements for the degree of doctor of philosophy in Cornell University. After a historical sketch of the subject the author describes methods of taking soil samples and isolating and cultivating the organisms. The major portion of the bulletin is taken up with taxonomic descriptions of the different forms.

The fungus flora of the soil was found to consist of obligate saprophytes and facultative parasites, the former being by far the more abundant. According to the author a fungus should not be considered as belonging to the soil flora unless it has been directly isolated or has been shown under control experiments to live in the soil. In this connection he demonstrated that *Phoma beta*, one of the causes of root rot of sugar beets, winters on the seed balls and not in the soil, while *Pythium debaryanum* and *Aphanomyces levis*, other organisms which attack the sugar beet, winter as saprophytes in the soil and not on the seed balls.

The presumable facultative parasites and the obligate saprophytes determined number 132 species and varieties, many of which are recognized as a cause of injury to economic plants.

A study was made of the effect of sulphur on the fungus flora of the soil, but 3 months after its application the soil yielded the same species of fungi as did samples which had received no application.

Bacteria and other fungi in relation to the soil, D. RIVAS (Contrib. Bot. Lab. Univ. Penn., 3 (1911), No. 3, pp. 243-274, fig. 1).—The author investigated the numbers and activities of about 28 kinds of bacteria, 2 of cocci and 10 of molds found in soils at 12 stations, and reports the following results and conclusions:

The bacterial contents of the soil were found to vary according to season, being least from November to February and increasing thereafter to a climax in September or October. These soils are found to be very rich in bacteria producing diastatic, flocculating, and proteolytic ferments which are especially adapted for digesting carbohydrates and proteids and which, by changing them into glucose and peptones, respectively, render this raw organic matter into assimilable substances. There is thought to be good reason to assume that this already elaborated food material is, through the agency of bacteria, thus made ready for absorption by the root system and for the nutrition of the plant. It is held, therefore, that not alone are water and salts in solution taken up by the root system of the plant but also already elaborated food, such as glucose, and further that such food, in addition to supplying energy and nourishment to the plant, may become a constituent of the protoplasm and may form organized structures, waste products, and reserve materials, this whole process thus resembling in essentials the process of assimilation in animals. Photosynthesis or auto-assimilation by the plant is not thought to explain all

the form of plant nutrition and in all probability the heterotrophic nutrition suggested by the author's experiments is to some extent effective.

Biological and toxicological studies upon *Penicillium puberulum*, C. L. ALLEN and G. P. BLACK (*Proc. Soc. Expt. Biol. and Med.*, 9 (1911), No. 1, p. 6; *ibid.* *Bot. Genet.*, 119 (1912), No. 21, p. 525).—This fungus, when grown in pure culture upon Raulin's solution, produces a new organic acid termed penicillic acid and thought to belong to the general class called lichen acids. It is stated to be moderately toxic, antiseptic in its action, and a protoplasmic poison. Since lichens are symbiotic forms, composed of fungi and algae, the finding of this type of substances in the pure culture of a fungus makes it seem probable that in lichens, the lichen acids are the products of the fungus metabolism and not of that of the algae.

Some conditions influencing nitrogen fixation by aerobic organisms, W. B. BERTHOLD (*Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 581, pp. 468-480).—A study has been made of *Azotobacter* and *Pseudomonas* separately and in combination to determine a suitable form of sugar for the growth of these nitrogen-fixing organisms.

Under usual conditions mannite is found most efficient for the growth of *Azotobacter* and maltose for *Pseudomonas*. The author's investigations, however, show that dextrin is about as efficient as maltose for *Pseudomonas* and as mannite for *Azotobacter*, while for a mixed culture of the two organisms it is much more efficient than a mixture of maltose and mannite. For both of these organisms the author recommends a simple and effective nutrient medium obtained by adding to distilled water 1 per cent dextrin, 0.2 per cent dipotassium phosphate, 0.02 per cent magnesium sulphate, and 0.4 per cent basic slag.

The influence of temperature on the movement of zoospores of *Chlamydomonas*, P. DESOCHÉ (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 19, pp. 1244-1247, Ag. 1; *Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), Nos. 17, pp. 748-750; 18, pp. 793-795, fig. 1).—Continuing previous studies on *Chlamydomonas* (E. S. R., 26, p. 431), the author found that the range of temperature within which movement of the zoospores is possible extends from the freezing point on the one hand to about 40° on the other, provided the containing water be very slowly warmed. Nearly all, however, became inactive between 30 and 32°. This fact and the facts of individual differences of endurance at given temperatures, of behavior on slower or more rapid warming, and of recovery on cooling make it difficult to fix a maximum limit of temperature for the activity of *Chlamydomonas*.

If the water containing the zoospores be very slowly warmed to 39° and there maintained, in about 15 minutes a marked degeneration of the cilia is observable which results in their complete disappearance in about 1 hour. The author remarks that the degeneration of cilia in this case is quite comparable with that observed in the case of *Pythium* and *Saprolegnia*, very different organisms from the one here studied.

Studies in seeds and fruits, H. B. GUPPY (*London, 1912, pp. XII+528, figs. 6*).—This book is the result of a study begun on the rest period of seeds and includes observations on some of the factors which are concerned in the rest period and germination of seeds, the relation of seeds to fruits, etc. Among the factors discussed are permeability, hygroscopicity, role of shrinking and swelling of seeds, homologues of fruits, dehiscence of fruits, relation of number of seeds to weight and size of the fruit, abortion of ovules, seed coloration, and rest period of seeds.

The influence of organic acids and glucose on the respiration of seeds during their swelling, Mlle. G. PROMET (*Rev. Gén. Bot.*, 24 (1912), No. 253, pp. 313-314).—In a previous paper (E. S. R., 25, p. 222) the author showed the

effect of citric acid absorbed by the seeds of tomato, pepper, maize, etc. In the present paper an account is given of investigations with beans and peanuts to determine the effect of citric acid and glucose solutions on the respiration of the seed.

It was found that the presence of these substances in a liquid medium where germinating seeds have begun to swell modifies the respiratory quotient, sometimes increasing and other times diminishing it, according to the variety of the seed and to the substance used. When the substance was acid there was always an increase, but when glucose was added there was an increase with some seeds, such as the bean, and a diminution with others, as was the case with the peanut.

Tannin in the seed coats of barley, A. REICHARD (*Ztschr. Chem. u. Indus. Kolloide*, 10 (1912), No. 5, pp. 214-219; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 596, II, pp. 592, 593).—In a previous publication Brown (E. S. R., 21, p. 126) showed that a membrane in the testa of the barley grain exerts a selective action on dissolved substances, inasmuch as only certain of them can pass through it into the seed. The present author has carried on a series of investigations and has found that there is a kind of tannin in the seed covering of barley and that there is an undoubted parallelism between the power of a substance to dissolve this material and its ability to penetrate the membrane.

The investigations were made by a variety of methods, which included the direct action of different substances on sections of the barley grain with subsequent examination of the membrane for tannin, and also adding various substances to ordinary tannin in a test tube and observing the effects. There appears to be some evidence that the tannin in barley is associated with a proteid, and the action of different substances on a compound of protein and tannin was investigated.

The author ascribes the results obtained to a solvent action on the tannin, thus permitting diffusion, or in some cases to a coagulating effect of the reagents on the tannin complex, which prevents diffusion.

Pentosans and methylpentosans in seeds of *Glycine hispida* and *Phaseolus vulgaris* during germination, K. MIYAKE (*Jour. Col. Agr. Tohoku Imp. Univ.*, 4 (1912), No. 8, pp. 327-335).—From a study of germinating bean seeds the author concludes that pentosans and methylpentosans are not ordinarily used as reserve or nutrient material in germination, being utilized rather to form skeletal structures, but that in case of exhaustion of the more readily available materials these carbohydrates are made to supply the usual offices of such substances, methylpentosans in the larger quantity of the two.

The artificial nourishment of seedlings, W. ZALESKI and N. TOROSKI (*Biochem. Ztschr.*, 43 (1912), No. 1-2, pp. 7-9).—The authors experimented with the axial parts of newly sprouted peas, sterilized and kept in darkness for 20 days in Knop's solution with addition of carbohydrates or in Knop's solution with a small amount of calcium sulphate to which was added either a nitrate, ammonium phosphate, asparagin, or crushed cotyledons of peas.

In carbohydrates these stems showed remarkable increase in size and dry weight, saccharose taking the most and galactose the least part in building new material. Nitrates, ammonia, and asparagin all gave considerable increase in nitrogenous materials, but their utilization is claimed to be indirect, the nitrates being first reduced and the nitrogen built into ammonia, later forming amino acids. Asparagin is thought to act in some small part directly in the formation of new nitrogen compounds. Ammonia is not thought to be directly elaborated into nitrogen products.

Investigations on the nourishment of seedlings with amino acids are still in progress.

effect of asparagin on absorption and growth in wheat, J. J. SKENNER and J. H. BACCHER (*Bul. Torrey Bot. Club*, 39 (1912), No. 3, pp. 429-437, pl. 1).—During the progress of studies of the organic matter in soils, experiments have been carried on with a number of organic compounds to determine their effect on plant growth. In the present paper an account is given of experiments on the effect of asparagin on the growth of wheat seedlings in culture solutions containing nutrient salts.

When the plants had grown for several days it was noticed that the asparagin cultures were better developed, the seedlings having broader leaves and longer and better developed roots. The effect of asparagin was more marked in the cultures containing potash and phosphate than in those which contain potash, phosphate, and nitrate.

This led to studies under control conditions which indicated that asparagin can be utilized for plant synthesis. The effect of the asparagin decreased with increasing quantities of nitrate, so far as additional effect on growth is concerned, but it was found to have a conserving effect on the nitrate left in the solution during the time the plants were growing.

Studies on the carbohydrates and nitrogen-containing bodies in grape leaves, N. T. DELEANO (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 80 (1912), No. 1, pp. 79-94).—In continuation of previous work (E. S. R., 25, p. 523), the author reports that by analysis of dried grape leaves gathered in September he was able to demonstrate the presence therein of dextrose, levulose, inositol, glutamin, and cholin, but not of sucrose, amino acids, alloxuric bases, histidin, arginin, or betain. A bibliography is appended.

Phosphoric acid and nitrogen in alcoholic extracts of leaves, J. SEISSL (*Ztschr. Landw. Versuchs. Österr.*, 14 (1911), No. 6, pp. 886-893; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 593, II. p. 288).—The author's analyses of leaves of horse chestnut, maple, oak, mock orange, and knotweed made monthly during the growing season showed a fairly constant decrease in total phosphoric acid and nitrogen, this diminution being usually more marked in the older leaves. The ratio of phosphorus to nitrogen also usually showed a decrease, notably in case of horse chestnut and especially just before leaf fall.

The influence of phosphates on the post-mortem respiration of plants, W. ZALESKI and ELISABETH MARX (*Biochem. Ztsch.*, 43 (1912), No. 1-2, pp. 1-6).—Continuing previous studies (E. S. R., 26, p. 729), the authors experimented with grain and pea seeds, pulverized and kept for varying periods in solutions of acid, alkaline, and neutral reaction.

It was found that, in general, acids decreased and alkalis increased the evolution of carbon dioxide. The latter effect, occurring (as in case of edestin) in absence of hydroxyl, is pointed to as an obstacle to acceptance of the views of S. Kostytschew and A. Scheloumow (E. S. R., 26, p. 627).

It is claimed that some part is played by the phosphates contained in the seeds tested. It is suggested also that the effect of alkaline phosphates is in part due to the protection given by the alkalinity against the depressing effect of acid-reacting substances (as casein) on the evolution of carbon dioxide, thus favoring a greater net result as regards this product.

Contribution to the study of circulation. Studies on the sweet potato (*Ipomoea batatas*), B. H. A. GEORGE (*New Jersey Stat. Rpt.* 1910, pp. 283-286, pl. 2, fig. 1).—In continuation of a previous report (E. S. R., 25, p. 431), an account is given of the circulation in the sweet potato as influenced by the rooting of the plants at the nodes. In addition to this work, an investigation with the object of tracing the movement of reserve starch in the circulation of a many-rooted sweet potato plant was begun. It was found that the storage starch in a sweet potato plant with the normal direction of the water current is

intercepted in its course by the first roots basal to the leaf from which it starts, and does not go beyond it.

The bearing of the results of these experiments on the cultivation of the sweet potato is quite evident, as they show that any portion of a many-rooted sweet potato plant may draw water from the roots most favorably situated, which are those in the main hill, so that whenever a drought occurs the rooted branches will draw water from the main hill. Every rooted joint of any branch intercepts all the starch brought from all the leaves beyond it and allows none to pass to the main hill. In a dry time a rooted branch may lead upon the main root, but in the best growing time it does not help the crop of the main plant in the least.

The stomatograph, W. L. BALLS (*Nature* [London], 87 (1911), No. 2180, p. 180; *Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 576, pp. 35-44, fig. 5).—The appliance here described and discussed is said to be a self-recording modification of Darwin's porometer (E. S. R., 27, p. 222), indicating changes in stomatal aperture by recording variations in the quantity of air forced through a leaf. It is claimed to be extremely easy to use, independent of weather changes, and especially adapted to outdoor conditions such as are met with in agricultural and ecological studies. Records obtained with Egyptian cotton indicated that this instrument may be of great utility in the study of purely economic matters connected with irrigation, and it is thought also that it may replace aspirators for many kinds of scientific research. The results of some studies on the behavior of stomata are given, and the significance of these stomatal changes as related to carbon dioxide assimilation in the growth of the plant is also discussed.

Photosynthesis and stomatal aperture, W. L. BALLS (*Nature* [London], 89 (1912), No. 2231, p. 555).—In the paper noted above the author, having found that Egyptian field cotton plants showed stomatal opening practically only from 6 a. m. to 12 m., reaching a maximum about 9 a. m., expressed the expectation that (1) this afternoon closure might be found to provide a limiting factor on photosynthesis by restricting the inward diffusion of carbon dioxide; and (2) since the theoretical possibilities of carbon dioxide assimilation have probably never yet been approached and since the stomata are wide open for an hour or two in the morning, record values in carbon dioxide assimilation might be obtained at the times of such maximum aperture.

The present brief report states that both these expectations have been fulfilled. It was found that assimilation was very greatly reduced, if not inhibited entirely, during the afternoon by the closing of the stomata. Some other data obtained are reported in this connection.

Reversible changes in permeability produced by electrolytes, W. J. V. OSTERHOUT (*Science*, n. ser., 36 (1912), No. 924, pp. 350-352).—Different opinions being held regarding the property of permeability of the cell, the author has investigated it to determine whether there are reversible changes which involve no injury and which may form a normal part of the activity of the cell. If such changes occur it is believed that they may control the course of metabolism.

Disks were cut from living tissue of the fronds of common kelp and their electrical conductivity in various solutions determined. It appeared that the permeability may be greatly decreased and then restored to the normal several times on five successive days without any trace of injury. Experiments with dead tissues, killed by heat or formalin, showed that the results were due entirely to the living cells.

It is concluded that it is possible to cause rapid and large changes in permeability by means of electrolytes, that these changes may consist in

either an increase or a decrease in permeability, and that within wide limits they may be completely reversible and entirely devoid of injurious effects.

Oxidases of *Cytisus adami*, F. KEEBLE and E. F. ARMSTRONG (Proc. Roy. Soc. (London), Ser. B, 35 (1912), No. B 581, pp. 460-465).—A study has been made of *C. adami*, which bears yellow, buff, and purple flowers, to determine from its oxidases the origin of this so-called graft hybrid. This plant, which is supposed to have been derived from *C. purpureus* budded on *C. laburnum*, has been considered a periclinal chimera, that is, a dual organism composed externally of one species and internally of another.

The author's investigations on the oxidases confirm Baur's hypothesis, the oxidases of the flowers produced from the different portions of the plant showing different reactions. There was also found evidence to support their own view that oxidases may migrate from cell to cell. It is believed that certain tissues of the vascular system may be regarded as secretors of oxidases which have among other functions the formation of flower pigments.

The primary color factors of *Lychnis* and color inhibitors of *Papaver rhoeas*, G. H. SHULL (Bot. Gaz., 54 (1912), No. 2, pp. 120-135).—The main substance of this report has already been noted (E. S. R., 26, p. 827), but later studies have resulted in discoveries necessitating the withdrawal of *L. dioica* for the present as an example of dominant white, apparently without affecting, however, the general considerations as originally presented. A bibliography is appended.

Cell number in the fruit of the prairie berry, B. H. A. GEORH (New Jersey Stat. Rpt. 1910, pp. 287-291, pls. 2).—The results of a study of heredity of fructation as shown in the prairie berry or garden huckleberry, a cultivated variety of *Solanum nigrum*, are given. Considerable variation in the number of cells in the fruit had been previously noted, and the fruits of several plants grown from the seed of a single fruit were examined and the variation observed. While the averages appear consistent and instructive, the author holds that the variation in individual plants was so great that they can not be considered conclusive.

Observations concerning evolution, derived from ecological studies in New Zealand, L. COCKAYNE (Trans. and Proc. New Zeal. Inst., 44 (1911), pp. 1-50, pls. 8, Agr. 3).—The results of an ecological study of the plants of New Zealand are given and the bearing of some of the facts upon evolution of species is discussed. The main object of the paper is to supply material of a botanical nature to students of evolution. A bibliography of the subject is appended.

FIELD CROPS.

[Field husbandry experiments], J. E. HOWITT and C. A. ZAVITZ (Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 46, 47, 51-54, 175-248, figs. 11).

—The work of 1910 has been previously noted (E. S. R., 25, p. 527).

A list of the weeds attracting most attention during the year is followed by descriptions of the Russian thistle (*Salsola kali* var. *tenuifolia*), crab or finger grass (*Digitaria sanguinalis*), water hemlock or spotted cowbane (*Cicuta maculata*), and wood horsetail (*Equisetum sylvaticum*), together with brief notes on their eradication. Spraying white cockle with a 30 per cent solution of iron sulphate prevented seed production and spraying ragweed in oats with a 0 per cent solution gave profitable results. Samples of red and alsike clover and alfalfa seed were tested for purity and the results are reported.

Weather conditions in 1911 are reviewed and a table is given showing the precipitation for April to September, inclusive, in each of the past 12 years.

The average yields per acre in a comparison of barley, emmer, oats, hull-less barley, spring wheat, field peas, and spring rye, mentioned in the decreasing order of yield, ranged from 2,672 lbs. to 1,709 lbs. of grain for the past 11 years. Results with 35 varieties of cereals and potatoes grown continuously on the same farm from 17 to 23 years show that fully 80 per cent of the varieties gave considerably larger yields during the latter as compared with the earlier part of the period. In this connection, suitable crop rotations are discussed and attention is called to the importance of growing the most profitable varieties.

Experiments on the influence of seed selection with different crops in progress from 6 to 9 years are described and a table is presented showing that in every instance the large plump seed gave a greater yield of grain per acre than small, shrunken, or broken seed. The crops entering into this experiment were spring and winter wheat, oats, barley, and peas, and exactly the same number of seeds were used in the different plats. Plant selection as a factor in crop improvement is dwelt upon, and the O. A. C. No. 21 barley and the O. A. C. No. 72 oats, originated at the college, are described. The O. A. C. No. 21 barley is a selection from Mandscheuri barley, which has long been the leading variety in Ontario but which is being supplanted at the present time by the new strain, which 4 years' cooperative experiments in Ontario have indicated to be the better of the two in yield of grain per acre, freedom from rust, and both length and strength of straw. The O. A. C. No. 72 oats, a selection from the Siberian variety, was distributed during the past year and the results secured have shown it to be a very promising variety when compared with other sorts such as Lincoln, Regenerated Abundance, and Siberian. It is pointed out that the distribution of new varieties is greatly facilitated by the Ontario Agricultural and Experimental Union, which numbered in 1911 4,490 experimenters.

When 9 different proportions of oats and barley were used in combination the mixture of 4 pks. or 34 lbs. of oats and of 4 pks. or 48 lbs. of barley per acre gave the highest results in a test of 6 years, as well as in a second test of 5 years. This mixture surpassed in yield of grain per acre any one of 16 other combinations. Different varieties of farm crops grown in combination with barley for 5 years, the rate of seeding being 1 bu. of each per acre, showed that in every single instance the resulting crop was over 50 per cent barley. The lowest percentage of barley was secured where Guy Mayle hull-less variety was used with Siberian oats, and the highest percentage where Mandscheuri barley was mixed with common flax. The influence of the Mandscheuri barley was more pronounced than any of the two-rowed barleys used in combination with oats. In studying the percentages of grain produced by different mixtures, it was observed that six-rowed barley and oats have a strong tendency to reproduce themselves even when sown in combination with a larger number of other leading varieties and classes of farm crops.

Work in combating loose smut in oats and stinking smut in wheat was continued and a number of different treatments were compared. Early Ripe oats proved practically immune to the attacks of smut spores, while Black Tartar and Siberian were quite badly infested in 1911. The results of all the experiments showed that the greatest yields of both winter wheat and oats per acre were secured from the grain immersed in a solution of 42 gal. of water and 1 pt. of formalin for 20 minutes. This treatment was the most effective in completely preventing smut in a 5-year test.

The average yield of winter barley grown at the college for 15 years was 54.8 bu. per acre, the average weight being 47.8 lbs. per measured bushel.

Within the past 18 years winter barley has been completely killed out on three occasions, while during some of the other winters it was partially killed.

In comparing the average results of varieties of oats, the percentage of hull as affecting the quality of the grain was taken into account. It is pointed out that Early Dawson oats, having an average weight of 37.55 lbs. per measured bushel in a 6-year test is not as valuable as the Daubeney variety which had a weight of only 34.29 lbs. per measured bushel, but which had nearly 10 per cent less hull. Observations made on the stooling of oats for 3 years indicated a variation in the average number of stools from 7 in Storm King and Tartar King to 18 in Joannette, Burt, and Regenerated Abundance. American Banner and Siberian occupied an intermediate position. It is stated that in general heavy stooling varieties appear to adapt themselves better to conditions than varieties which stool very little.

Experiments with potatoes led to the conclusion that good-sized tubers of good shape should be selected for seed and that the sets should vary in size from 1 to 2 oz. and have from 2 to 4 eyes each. The yields from level and from hilled cultivation have shown practically no difference in experiments over a series of 10 years. In wet seasons, hilled cultivation and in dry seasons level cultivation gave the best results. In experiments with Bordeaux mixture in combating potato blight, the best results were obtained from spraying 3 times on top and underneath the vines. This treatment gave larger yields per acre than when the potatoes were sprayed from 5 to 6 times on top of the vines.

During the past 6 years, Japanese Panicle millet, Japanese Barnyard grass, and Hungarian grass were sown at intervals of about 2 weeks beginning May 15 and ending August 1. The highest average yield for the 3 varieties, 8.28 tons of green crop per acre, was obtained from the seeding made June 1.

The average results for the past 11 years with a number of miscellaneous leguminous crops grown for green fodder show that hairy vetch ranked first in green fodder production per acre with a yield of 7.1 tons, being followed by Grass peas, Early Yellow soy beans, and Wonderful cowpeas with 6.8, 6.5, and 4.9 tons per acre respectively. In numerous experiments with red clover, it was found that land, after growing this crop, was more easily plowed and was in a more friable condition than land on which timothy, meadow fescue, or orchard grass had been grown. Tests made with alfalfa resulted in an average yield of 20.41 tons of green crop and 4.9 tons of hay per acre for a period of 14 years. Canadian Variegated alfalfa has proven very hardy and is considered worthy of special attention in the Province of Ontario.

Good results were secured from a pasture mixture consisting of 51 lbs. of oats, 30 lbs. of Early Amber sugar cane and 7 lbs. of red clover per acre. This mixture was used for a temporary pasture of 1 year's duration. For permanent pasture 4 lbs. of orchard grass, 4 lbs. of meadow fescue, 3 lbs. of tall oat grass, 2 lbs. of meadow foxtail, 2 lbs. of timothy, 2 lbs. of alfalfa, 2 lbs. of alsike clover, and 2 lbs. of white or Dutch clover per acre are recommended in the light of experience for more than 20 years' work in testing different varieties of grasses and clovers for this purpose.

The higher yields obtained in variety tests are indicated in the following table:

Summary of the more notable yields secured in variety tests.

Crop and variety.	Number of varieties tested.	Period of test.	Average yield per acre.	Crop and variety.	Number of varieties tested.	Period of test.	Average yield per acre.
Barley (Mandschauri).....	7	Yrs. 5	Bu. 76.60	Broom corn (Early Japanese).....	3	Yrs. 9	Bu. 22.49
Barley (Imported No. 5501 Iowa)...	6	5	64.39	Corn (Early California Flint)....	12	5	55.70
Barley (Guy Mayle)...	6	5	45.94	Potatoes (Davies Warrior).....	57	5	239.40
Oats (Daubeney)....	30	6	79.89	Mangels (Eckendorf).....	12	5	26.98
Wheat (Dawson Golden Chaff)...	14	16	54.10	Sugar beets (Renlie Jumbo).....	12	5	24.20
Wheat (Carleton)...	15	5	32.44	Swedes (Keepwell)....	14	5	26.02
Wheat (Roumania)...	7	5	33.35	Carrots (Steele Improved Short White).....	6	6	28.00
Wheat (Wild Goose).....	3	19	37.50	Fodder corn (Eureka).....	47	5	24.03
Emmer (common)...	3	10	Lbs. 2,872	Sorghum (Orange sugar cane).....	9	13	15.26
Spelt (Alstrom).....	3	10	Bu. 2,115	Millet (Japanese Panic).....	9	5	4.10
Rye (Petkus).....	3	7	30.00	Cabbage (World Beater).....	4	5	20.60
Buckwheat (Rye)...	5	7	31.00	Timothy (Pasture)...	4	4	1.03
Field Peas (Early Britain).....	8	12	38.88				
Flax (Manitoba)....	4	7	17.55				
Millet (Siberian)...	7	8	51.80				
Sunflowers (Mammoth Russian)...	3	13	76.61				

[Forage and cover crops], F. C. MINKLER (*New Jersey Stat. Rpt. 1910, pp. 51-57*).—Good results are reported from the use of oat and pea forage run through the ensilage cutter in a slightly wilted condition and placed in the silo. In this way silage in prime condition was provided for dairy cows during the entire summer season and the milk flow was maintained during the period of hot weather and the lack of green forage.

A total of 98 tons, or an average of 5.9 tons per acre, was secured from 16½ acres of alfalfa at the station. A new seeding of 10 acres yielded 30,427 tons of cured hay mowed May 30. The manner of making this seeding on August 24 of the preceding year is described in detail.

The yield of 9 tons of forage is reported from an acre of ground seeded in September, 1909, with 50 lbs. of rye and 20 lbs. of vetch drilled in rows 8 in. apart. The yield of hay from 9 acres of oats and peas was approximately 3 tons per acre, and fertilizer tests continued in this connection confirmed previous results, showing that basic slag supplies phosphoric acid more economically than ground bone and acid phosphate. The use of different cover crop mixtures, the principal one consisting of 40 lbs. of wheat and 25 lbs. of winter vetch per acre, seeded just prior to the last cultivation of corn during the latter part of July, is reported.

The seed-corn situation, C. P. HARTLEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 95, pp. 13, figs. 2*).—The general seed-corn situation in the spring of 1912 is reviewed and means of preventing such situations are suggested.

Results secured in 2 series of 5-year tests made by the Office of Corn Investigations and 28 experiment stations for the purpose of observing the value of home-grown seed showed that a variety stood high or low in rank according to its adaptation or lack of adaptation to the locality in which the test was made. In one particular instance, a variety native of Sabina, Ohio, was taken 50 miles north and grown for 5 years at Sunbury in that State. Equivalent lots of Sabina-grown seed and Sunbury-grown seed were then tested at both points.

At Sabana, the Sabana-grown seed produced better by 47 per cent, while at Sunbury the Sunbury-grown seed produced better by 11 per cent.

Germination tests made by the Seed Laboratory of this Department of 1,708 samples of seed corn from 17 of the principal corn-growing States and intended for use in the spring of 1912 gave an average germination of 81 per cent, the lowest germination for the different States ranging from 0 to 30 per cent. The seed corn sent from 7 of these States contained samples with 0 per cent of germination. Tests made by this laboratory of 73 samples of seed corn from 8 different States gathered and dried early by the Office of Corn Investigations gave an average germination of 98.1 per cent.

The care of seed corn is discussed and the results of experiments to demonstrate the possible profits from the good preservation of seed corn are reported. It is stated that 17 tests of seed corn dried and stored in a seed-corn dry house and of seed corn stored in the crib gave figures showing an average increase in yield of 5 bu. per acre in favor of the special storage. A more extensive field test along the same line gave similar results.

Inheritance in corn, H. K. HAYES (*Connecticut State Sta. Rpt. 1911, pt. 6, pp. 407-425, pls. 8*).—This article summarizes in a popular manner the results of corn breeding work carried on by the station for the last 6 years and previously noted (*E. S. R.*, 17, p. 857; 25, pp. 736, 737). The way of detecting and culling out the accidental hybrid seed is described and the manner in which desirable qualities are inherited is pointed out. In discussing crosses showing dominance, the appearance of the crosses, the production of the seed of pure varieties, and the inheritance of characters is considered. The behavior of crosses not showing dominance is also discussed and notes are given on abnormalities, including dwarf forms, divided ears, and irregularity in the rows of seeds.

Results of cotton experiments in 1911, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 96, pp. 21*).—This bulletin reports the progress in experiments with cotton and summarizes briefly the principal conclusions, especially those affecting general problems of breeding and crop production.

Attention is called to the utilization of improved varieties of American Upland cotton bred by this Department for the improvement of the cotton industry, and to the results secured in Texas and other southwestern States with acclimated new types of Upland cotton introduced from weevil-infested regions of Mexico and Central America. One of the new varieties from Mexico, known as Durango, was found to be the most promising Upland long-staple cotton for irrigated districts in that region. The advantages to be gained from cooperative organization on a community basis for the production and marketing of a single superior variety of cotton are pointed out.

Improved methods of selection in which the value of distinctive characters by which the plants may be recognized in the field is taken into account, and better methods of distributing select varieties to avoid waste and to encourage the production of superior fiber on a community basis were devised and are described in detail. Cultural methods are suggested for avoiding malformations of young seedlings which often delay the development of the plants and reduce the yield. Several methods of utilizing superior first-generation hybrids between Egyptian and Upland varieties of cotton, including the propagation of such hybrids from cuttings, are reported as being under test.

Experiments have shown the possibility of controlling the development of vegetative branches by thinning the plants gradually and restricting the supply of water in the early stages of growth. This control, it is pointed out, facilitates cultivation and picking and favors greater production.

It was observed that the Egyptian type of cotton was less susceptible to the shedding of the buds and young bolls than the Upland cotton and that the differences in habits of growth and methods of picking render the Egyptian cotton superior to the Upland type as a family crop. It is believed that the successful production of Egyptian cotton in Arizona and southern California does not justify expectations of similar results in Texas where the conditions are essentially different and where the Durango variety is preferable for the irrigated districts.

Cotton crop of the United States, 1790-1911, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Circ. 32, pp. 9*).—The production, value, domestic exports, net imports, and consumption of cotton in the United States for the years 1790 to 1911, inclusive, are reported in tabular form. Prior to 1867 no figures for the average yield per acre, and prior to 1869 no data for the value of lint, are reported.

Hop crop of the United States, 1790-1911, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Circ. 35, pp. 8*).—In so far as the data are available the production, value, domestic exports, imports, and consumption of hops for the United States from 1790 to 1911, inclusive, are given in tables.

Potato culture, H. J. EUSTACE (*Michigan Sta. Circ. 15, pp. 4, fig. 1*).—Popular notes on the culture of potatoes are presented.

Potato spraying experiments, 1902-1911, F. C. STEWART, G. T. FRENCH, and F. A. SIRRINE (*New York State Sta. Bul. 349, pp. 99-139*).—This bulletin gives a detailed account of potato spraying experiments conducted in 1911 and summarizes the results of similar experiments made during the 9 years preceding and already noted (*E. S. R.*, 25, p. 442).

The main experiments were conducted at Geneva and Riverhead, Long Island, and at each place one series of plats received annually 3 sprayings of Bordeaux mixture and another series 5 to 7 sprayings. At Geneva, 3 sprayings resulted in an average increase of 69 bu. per acre for the 10 years as compared with 97.5 bu. per acre for from 5 to 7 sprayings. In the Long Island experiments 3 sprayings gave a 10-year average increase of 25 bu. per acre and from 5 to 7 sprayings an increase of 45.7 bu.

The results of experiments made by farmers during 9 consecutive years to determine the actual profit in spraying potatoes under farm conditions showed an average increase of 36.1 bu. per acre in favor of spraying. The total expense of spraying in these experiments was \$4.74 per acre and the net profit \$14.43 per acre. In 205 experiments carried out entirely by farmers themselves over a period of 7 years, the average increase in yield was 54.3 bu. per acre.

Spraying thoroughly when the plants are from 6 to 8 in. high and repeating the operation at intervals of from 10 to 14 days throughout the season is recommended.

Ten years of potato spraying, F. H. HALL (*New York State Sta. Bul. 349, popular ed., pp. 11*).—This is a popular edition of the above.

A preliminary report on rice growing in the Sacramento Valley, C. E. CHAMBLISS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 97, pp. 10, pls. 4*).—Tests with 300 varieties of rice were begun in 1909 in the Sacramento Valley on a black adobe soil of a close compact structure. The seed of each variety was planted with a drill to a depth of 1½ to 2 in. at the rate of 80 lbs. per acre on plats consisting of 4 rows a rod each in length and 7 in. apart. In 1910 a selection of 13 varieties from the 300 was tested on ½-acre plats. The yields for the different varieties ranged from 23.1 to 154 bu. per acre and the growing season from 142 to 193 days. In another test in 1910 in which the yield was estimated upon the actual yield from plats ½-acre in size the Wataribune (*G. I.*

No. 1041) and the Shinriki (G. I. No. 1042) varieties yielded 113.7 and 137.2 bu. per acre respectively.

It was found that in the Sacramento Valley the rices under test required a longer time to mature and produced smaller plants than when grown on the plains of the Gulf coast, but that they exhibited a greater capacity for tillering with resultant larger yields. The Honduras and Shinriki varieties (G. I. Nos. 1041 and 1042), the leading commercial rices of the United States, exceeded in this test the maximum yields produced on experimental plats in Louisiana and Texas. Of the two, the Shinriki is considered better adapted to the Sacramento Valley. It is pointed out that the Wataribune, the Oizan, and the Shinriki varieties produced good crops but that earlier maturing varieties of good quality, though producing less per acre, may be more remunerative for this locality. Suggestions as to the methods of culture are given and the statement is made that the results of the 2 years' work indicate the possibility of rice culture in the Sacramento Valley.

Rice crop of the United States, 1712-1911, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Circ. 34, pp. 11*).—Tables are given showing in so far as data were obtainable the production, value, domestic exports, imports, and consumption of rice for the United States for the years 1712-1911, inclusive.

Tobacco crop of the United States, 1612-1911, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Circ. 33, pp. 12*).—Data regarding the production, value, domestic exports, net imports, and consumption of tobacco in the United States from 1612-1911, inclusive, are given in tables.

Tobacco report, July 1, 1912, J. P. KILLEBREW (*U. S. Dept. Agr., Bur. Statis. Circ. 38, pp. 7*).—The acreage of tobacco in the United States July 1, 1912, by States and districts is reported in tables and the condition of the crop at this date is described. The 1912 area of cigar-leaf tobacco is given at 172,400 acres against a final estimate of 177,400 acres in 1911, and the acreage of the chewing, smoking, snuff, and export type is reported at 1,012,300 acres as compared with a final estimate of 819,500 acres in 1911.

Growing winter wheat in Iowa, L. C. BURNETT (*Iowa Sta. Bul. 133, pp. 253-273, figs. 11*).—This bulletin reviews the history of winter wheat in Iowa, presents statistics showing the relative production of spring and winter wheat for the State, and reports the results of experiments carried on by the station. Notes are given on cultural methods and on crop rotations including winter wheat.

The average yields of 4 winter wheat and 4 spring wheat varieties at the station for the 5 years 1906-1910, inclusive, were 33.8 and 24.2 bu. per acre, respectively. Experiments with 10 varieties of winter wheat carried on from 1906-1910 showed that the Russian types Malakoff, Imported Turkestan, Minnesota No. 529, and Turkey Red gave uniformly good results and produced on an average for this 5-year period 36.9, 36, 35.5, and 34.3 bu. per acre, respectively.

A 4-year comparison of drilling and broadcasting winter wheat resulted in an average yield of 29.1 bu. per acre on the drilled and of 24.9 bu. on the broadcasted plats. It is stated that the best results at the station were secured from placing the seed in the top of the moist earth below the dust mulch, or about 1½ to 2 in. below the surface. The yields so far obtained have favored sowing early in September. In 1912, the station obtained a good stand and also broke the crust by drilling clover in the standing wheat about April 20.

On the vitality of farm seeds; W. CARBOTHERS (*Jour. Roy. Agr. Soc. England, 12 (1911), pp. 168-183, figs. 5*).—The author describes briefly a machine similar to, or identical with, the "Preparator" previously described by Hume and

Garver (E. S. R., 27, p. 235), and states that "a similar machine was made in England, at my suggestion, with the result that clover seeds may be purchased with a guaranteed germination of 98 or 100 per cent. This gain was clearly established by these experiments. . . ."

A brief account is given of a transfer of live wheat embryos to dead seed kernels of various colors. The results "clearly show that living embryos transferred to the food store of dead seeds utilize it freely, and that the store of food retains all its properties for many years after the seed is dead."

Samples of 43 kinds of farm seeds were secured from the harvest of 1895 and stored during the succeeding 16 years in paper bags in close cabinet drawers. Germination tests indicated that the germinating power of barley and wheat was but little affected during the first 5 years, but decreased with increasing rapidity from that time until the tenth year, when no live seeds remained. Oats showed no serious loss of vitality until after the ninth year. Five years later white oats showed no living seeds, but black oats germinated for 15 years. The retention of vitality by oats is attributed to the adherence of the glumes.

In case of grasses the "death of all the samples occurred between the eighth and thirteenth years." Three main types appeared, one represented by timothy and tall oat grass, in which vitality was well maintained for 4 years and dropped rapidly thereafter; a second, of which hard fescue and sheep fescue were most characteristic, in which the germination tests showed a rapid drop to a point below 10 per cent, at which they remained practically stationary for a year or so before vitality disappearing entirely; the third crop is typified by Italian rye grass and less perfectly by meadow fescue, and shows a fairly steady loss of vitality from first to last.

The 3 true clovers (red, white, and alsike) showed a slight loss of vitality during the first 3 or 4 years, a rapid loss of vitality for about 4 years more, and finally the gradual loss of the last 10 per cent during the next 3 or 4 years. Trefoil lost vitality very steadily from first to last. Sainfoin lost almost as steadily. Alfalfa decreased rapidly at first then changed little between the fifth and ninth years after which it decreased quite regularly, being practically dead at the end of the fourteenth year.

Of the cruciferous seeds tested, 5 sorts were entirely dead at the end of the thirteenth year, and 4, kale, white turnip, and purple and green top swedes showed very rapid decreases in vitality during the tenth year. The decrease in case of rape and the yellow turnip was decidedly slower but began somewhat earlier. Rape was entirely dead during the eleventh season. Carrots and yarrow seed lost their vitality at a rather uniform rate and entirely during the tenth and eleventh seasons, respectively. Tables and curves show in detail the results of the germination tests from which these conclusions are drawn, and tables state the results of other tests dealing with the rapidity of germination of seed of the same group of plants.

HORTICULTURE.

[Report on investigations in plant heredity and plant shading], B. D. HALSTED ET AL. (*New Jersey Stat. Rpt. 1910*, pp. 221-272, 277-282, 292-295, pls. 29, figs. 2).—In continuation of previous investigations (E. S. R., 25, p. 441) inheritance in plants was studied in the following truck crops: Beans, corn, egg-plants, okra, peas, peppers, squashes, and tomatoes. In order to lay a foundation for the determination of rules of inheritance that may be of general application special emphasis has been laid upon the behavior of tomato crosses in their first generation. The types selected have been bred reciprocally with each other and the plants extensively studied from seedling to full maturity.

results of this study to date are here briefly summarized. A full report of the work has been published in a series of bulletins (see page 742).

Owing to a prolonged drought poor results were secured from the corn breeding work in many instances. The behavior of a few of the more promising crosses is briefly discussed. A further study was made during the year relative to flintiness in sweet corn. The test appeared to point to two kinds of flintiness or starchiness, one of which, it is suggested, may illustrate a type of seed character that is transferred by the pollen; the other form is classed as an ear or plant character. When the latter form of flintiness is present it does not appear to be readily transmitted through cross pollination to adjacent pure sweet grains.

A number of eggplant crosses and hybrids are discussed with reference to their inherited characters, and attention is also given to the nature of the eggplant inflorescence and changes during the growth of the fruit. A similar but more detailed study of the life history and structure of the leading types of peppers is reported, together with tabular data on a number of second generation crosses.

In the work of breeding and selecting for choice sorts of tomatoes several promising crosses selected for length of the fruit have been tested. A few of these crosses are briefly discussed. A brief study similar to that for the eggplant was also made of the development of the okra fruit during the growing season. Tests of the pepino or melon pear (*Solanum muricatum*) indicate that it is of no economic importance as compared with the eggplant, its near relative.

Experiments in limitation of fruit bearing were conducted with tomatoes, eggplants, bush beans, and bush squashes. For the plants studied the results indicate that excessive fruit thinning unaccompanied by vegetative pruning leads to a rank vegetative growth and only a slight increase in the size of the few remaining fruits. There appears to be a certain limit for every plant as to the actual size of its fruits, regardless of the quantity produced.

Observations were made of the effect of a midsummer drought upon a number of ligneous plants. A well-marked zone of retardation in the growth of both leaves and stems corresponding to the drought period was observed. At the resumption of favorable moisture conditions, the leaves and stems again assumed normal size.

Tests of a number of ornamentals secured in previous breeding work are briefly noted. They include hybrid forms of dianthus, foxglove, Nicotiana, pansy, and hibiscus and a pelargonium cross. A comparative test of the Russian sunflower (*Helianthus annuus*) grown on poor soil and on rich soil resulted in an increased number of ray flowers for the heads growing on rich soil. A diagram is given showing the great variation in number of ray flowers in a large number of heads of the Blackeyed Susan (*Rudbeckia hirta*). Observations of leaf variation in the common ragweed (*Ambrosia artemisiifolia*), giant ragweed (*A. trifida*), green milkweed (*Acerates viridiflora*), and the Drooping Forsythia (*Forsythia suspensa*) are discussed and illustrated.

A preliminary experiment in growing plants under shade was conducted in the greenhouse during the summer of 1910 to serve as a guide for the selection of material and suitable conditions for a larger field experiment. Of the plants observed, it appears thus far that beans, Bryophyllum, radishes, Kochia, and corn furnish good examples of different effects of shade; but all except beans and Bryophyllum suffer too severely in the shade.

Inheritance studies with beans were continued along lines previously noted and are reported separately (pp. 277-281), by E. J. Owen.

Horticultural information (*Ohio Sta. Circ. 124, pp. 145-147*).—This circular comprises a guide to the accessible sources of information relative to various phases of horticultural practice. Attention is called to the publications of the state and government institutions and a list is given of books, bulletins, and periodicals dealing with horticultural subjects.

Vegetable growing in Alabama, P. F. WILLIAMS and H. M. CONOLLY (*Alabama Col. Sta. Circ. 14, pt. 2, pp. 59-83, figs. 2*).—Part 1 of this circular (E. S. R., 26, p. 740) discussed in detail commercial vegetable growing in Alabama. The present part contains popular directions for growing the more important vegetables in the home garden. Notes are given relative to storage, home canning, and some common insects and diseases of the garden.

A planting table adapted to Alabama conditions is appended.

The F₁ heredity of size, shape, and number in tomato fruits, B. H. A. GAORH (*New Jersey Stat. Bul. 242, pp. 3-39, pls. 3, figs. 8*).—In continuation of a series of studies previously reported (E. S. R., 25, p. 828) this bulletin describes the inheritance, in the first generation of crosses, of macroscopical and microscopical structures in a number of types of tomatoes. Heredity of size and shape of fruit, number of locules in the fruit, size of the epidermis of fruit cells, and thickness of the radial wall of the epidermis in fruits are shown in a series of charts and discussed at length.

The principal deductions derived from the work are summarized as follows:

"Fruits of tomato types may possess latent factors for size and shape different from those they exhibit. Either the factors for the actual size and shape or the latent factors may be active in a cross to determine the size and shape of the F₁ fruits.

"The size and shape of the F₁ fruits are the geometric means between the size and shape corresponding to those factors of the parents, which were active in crossing.

"Fruits of tomato types may carry a factor for two locules; or a factor for two locules and another for addition cells; or a factor for two locules, another for addition cells, and a third for a broken center.

"When types possessing a factor for addition cells are crossed with two-celled types or with each other, the differences between the number of locules of the cross and those of the two parents separately bear to each other the same ratio as the differences between the surface area of the equatorial section of the F₁ fruit and the respective areas of the two parents separately bear to each other.

"In crosses of types possessing factors for a broken center with other types, the inheritance of cell number in the F₁ fruit is similar, except that another factor for cell number, a function of the respective factor for broken center, becomes active in determining the cell number of the cross.

"In the F₁ fruits of types possessing factors for broken centers with each other, the factor for the lower cell number seems to be dominant. (Five instances only.)

"The F₁ heredity of size, shape, and number in cell structures of the fruit also is influenced by other unknown factors besides the factors for size, shape, and number apparent in the parents.

"Reciprocal and duplicate crosses usually agree in the inheritance of characters studied; but they may differ greatly. Even fruits borne by plants raised from the seed of one fruit pollinated by pollen from a single flower may differ radically in characters of size, shape, and number.

"When crossing the rough 'Peaches' with smooth types, partial Xenia may occur."

Orchard irrigation studies in the Rogue River Valley, O. I. LEWIS, E. J. KRAUS, and R. W. REES (*Oregon Sta. Bul. 113, pp. 47, figs. 11*).—During the past 5 years the station has been conducting orchard irrigation investigations, especial attention being paid to a determination of the best dates as well as the best amounts and ways of applying the water under the various soil and orchard conditions found in the Rogue River Valley. The work for each season is here discussed in detail.

Irrigation practices in the Rogue River Valley were found to vary according to the soil, the kind of fruit grown, and the age of the trees. Some of the heavier soil types have shown best results under cultivation without the use of water. Soils of medium texture derived a direct benefit from light irrigation. The lighter types of soil under ordinary circumstances show that a considerable amount of irrigation is necessary for the production of commercial fruit on heavily bearing trees. The use of an excessive amount of cold water in the irrigation of pear trees on sticky soils is considered a questionable practice, since it did not increase the size or quality of the fruit and the result on the tree was detrimental rather than beneficial. Bartlett pear trees which are in good vigor and planted on strong soils appear to become more susceptible to disease under irrigation.

Irrigation aided in giving a larger percentage of fruit of marketable size. In some cases the reduction in the number of windfalls amounted to as high as 15 per cent of the crop. There were less culls caused by calyx cracking on the irrigated plats than on the dry checks. Irrigation had a tendency to keep both the wood and foliage more active in the fall, as well as to prevent premature ripening of the fruit. The shape of the fruit was found to be materially changed by irrigation. The apples receiving the best care were more elongated and angular, while those that suffered through lack of moisture had a tendency to become flat. The effect on color was more noticeable on the lighter soils where red apples were grown. The irrigated apples had a brighter, more attractive color while those grown on the checks were duller yet deeper in color. In many cases irrigated trees had more numerous and stronger fruit buds for the succeeding crop. By means of irrigation a much better stand of cover crop can be secured in late summer and early fall. Attention is called to the importance of cultivation and good drainage as adjuncts to irrigation.

The temperature of well water was found to increase in some cases as much as 8½° during the day while flowing in open furrows to the point of distribution. Water used from an irrigation ditch showed in some cases an increase of 18½° over the morning temperature. In both cases where temperatures were read it was found that the soil had decreased in temperature immediately following the irrigation. The decrease was more noticeable in the surface soil. It amounted in some instances to a difference of 3° in temperature.

To assist in determining the benefit or detriment of irrigation with respect to the development of the fruit itself, a study of the effect of irrigation on the chemical composition of the apple is now in progress.

Cover crops for Michigan orchards and vineyards, H. J. EUSTACE (*Michigan Sta. Circ. 18, pp. 123-134, figs. 10*).—This circular describes the most common systems of orchard soil management, and discusses the value of various plants for cover crop purposes as determined in orchards of various ages and on different soil types and located in various parts of the State.

Of the leguminous crops winter vetch and Mammoth clover appeared to be the most valuable, the latter doing somewhat better than winter vetch upon a clay soil. Spring vetch and Canada peas have also proven of value. Of the nonleguminous crops buckwheat, rye, oats, and barley were found to be adapted

to Michigan conditions. A combination of oats and winter vetch or oats and peas is considered much better than oats used alone.

The pollination question (*Oregon Sta. Circ. 20, pp. 7*).—A discussion of the pollination of apples and pears, in which is set forth some of the practical results obtained in the station's work throughout the State for several years past. A general broad view is also given of the important points to be kept in mind with respect to orchard pollination. A publication dealing exclusively with the research phases of the pollination work will appear in the future.

The circular concludes with a list of commercial varieties of apples and pears most grown at the present time in Oregon and grouped according to the desirability of interplanting to secure best results from pollination.

Top working apple trees, C. P. HALLIGAN (*Michigan Sta. Circ. 14, pp. 52-54, figs. 2*).—A popular circular describing the method of top working apple trees by means of the cleft graft.

Dressings for pruning wounds of trees, A. D. SELBY (*Ohio Sta. Circ. 126, pp. 163-170*).—A popular circular containing suggestions relative to available antiseptic materials, the essential requirements of a wound dressing, and the available materials for wound dressings.

Recent investigations in fig culture and caprification, G. P. RIXFORD (*Pacific Rural Press, 84 (1912), Nos. 2, pp. 28-30; 3, pp. 52-53*).—A popular review of the progress made in recent investigations dealing with the establishment of the Smyrna fig industry in California.

The severe frosts of the past winter proved very disastrous to the mamme crop of caprifigs in which the *Blastophaga* are harbored during the winter. To offset this difficulty a California fig grower made the important discovery that the mamme figs may be taken from the tree in December before the advent of heavy frosts, stratified in a box of clean, damp sand, and stored over winter in a cellar without injuring the *Blastophaga*, which were found to come out as usual and enter the profichi, or spring crop of caprifigs. By harboring the insects in this manner it is suggested that it may be possible to extend the Smyrna fig industry all along the Gulf region of the Southern States from Florida to Texas.

New method of extracting olive oil, F. T. BIOLETTI (*Pacific Rural Press, 84 (1912), No. 16, p. 372*).—A new method of extracting olive oil from fresh olive pulp, which has been recently tested in Italy with good results, is here briefly described.

Instead of using a press as in the ordinary methods of extracting olive oil, the extractor consists of 2 concentric cylinders separated by a narrow space. The outer cylinder is of sheet metal and the inner one is a metallic screen. The olive pulp is placed in the inner cylinder and kept in motion by a revolving axle furnished with aluminum pallets. By means of a suction fan attached to the lower half of the outer cylinder a slight difference of pressure is produced between the inside and the outside of the inner cylinder. The oil and water are thus extracted from the pulp. Contrary to the results secured in the ordinary press, the oil comes out more easily than the water and a greater proportion of water remains in the pulp. It is claimed that about 10 per cent more oil is obtained from the new system and that the quality of the oil is uniform and equal to or better than the first run from ordinary presses. The olives can be worked while fresh and the troubles and defects due to drying, molding, and rotting are avoided.

Report on experiments with citrus fruits at the Beeville substation, A. T. PORRS (*Texas Sta. Bul. 148, pp. 5-22, pl. 1, figs. 10*).—This bulletin comprises a brief résumé of the experiments with citrus fruits which have been conducted at the substation during the past few years. The varieties which

have proved most resistant to cold are indicated and attention is called to the most improved methods of cultivation to secure both production of fruit and resistance to cold.

The experiments to date have shown that the only varieties which are sufficiently frost resistant to be used in commercial plantings are the Kumquat and the Satsuma. By selecting favorable sites, planting windbreaks, giving good cultivation, and sowing winter cover crops, the danger from frost injury can be greatly reduced. It is recommended, however, that no extensive planting be made without some well-defined plan for fighting the frost.

Experiments in the use of orchard heaters during the winters of 1911 and 1912 are described. The author concludes in substance that although there is no question as to the value of orchard heaters as an aid in frost protection, since the freezes that occurred in the winters of 1911 and 1912 would tax to the utmost any system of orchard protection, it is yet to be determined whether orchard heaters may be used for a number of years under Texas conditions with a degree of profit to the grower. Shortly before cold weather is expected all varieties of citrus fruits should have clean earth piled above them to a height of 12 to 18 in. In case of a severe freeze all wood thus covered will be saved.

The better oranges, limes, and lemons; E. CHAVEZ (*Estac. Agr. Cent. [Mexico] Bol. 67, 1912, pp. 72, pls. 42*).—This comprises descriptive accounts of the principal species and varieties of citrus.

FORESTRY.

The Michigan woodlot, J. F. BAKER (*Michigan Sta. Circ. 17, pp. 107-122, figs. 6*).—This is a brief popular treatise on woodlot management. It discusses the scope of farm forestry, the present condition of Michigan woodlots, timber estimating, woodlot protection, cutting, reproduction, establishment of new woods, and species and soils. A short note is also given relative to the State cooperative woodlot work.

Forty years' management of woods, D. TAIT (*Quart. Jour. Forestry, 6 (1912), No. 4, pp. 279-298*).—This comprises a report of the management of the woods on the Owston Park estate, near Doncaster, England, for a 40-year period with special reference to the financial returns secured.

The relative yields obtained by the destructive distillation of different forms and species of hardwoods, L. F. HAWLEY and R. C. PALMER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 6 (1912), Sect. IV, pp. 138-146*).—Tests made to determine the commercial value of different species of hardwoods as raw material for distillation are described. Data obtained in each of the distillations, together with the average yields of alcohol and acid from different parts of the tree, are given for beech, birch, maple, gum, chestnut, and hickory.

Distillation of resinous wood by saturated steam, L. F. HAWLEY and R. C. PALMER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 151-176, figs. 5*).—This is a report of an investigation of the fundamentals of the steam distillation process. Pitchy longleaf pine was used in the distillation tests. The results are presented in tabular form and discussed. Consideration is given to the effects of the size of chip, pressure of steam, speed of distillation, and end point at which distillation is stopped, on the yield of total oil, the composition of the oil, and the amount of steam required to remove the oil.

Tests to determine the commercial value of wood preservatives. A progress report, H. F. WEISS (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 279-300, figs. 5*).—An account of preliminary experiments conducted to determine the practical value of a number of substances which have been either used or suggested as wood preservatives. The following points were studied in these tests: The important chemical and physical properties of the preservative; the effect of the preservative on the strength of the wood treated; penetration and diffusion of the preservative through the wood; permanency of the preservative after its injection into the wood; the combustibility of the treated wood; toxic efficiency of the preservative; the corrosive action on steel; and the effect of the preservative on paint applied to the wood subsequent to treatment. *

Recent investigations in the realm of wood conservation, E. F. PETARTSCH (*Centbl. Gesam. Forstw., 38 (1912), Nos. 6, pp. 265-282, figs. 8; 7, pp. 321-333, figs. 3; 8-9, pp. 333-392, figs. 2*).—A general review of experimental work in the use of wood preservatives.

DISEASES OF PLANTS.

Smut fungi and smut diseases, V. O. BREFELD (*Untersuch. Gesamtgeb. Mykol., 1912, XV, pp. V+151, pls. 7*).—In continuation of previous studies of the author (*E. S. R., 13, p. 449*), this volume is largely taken up with a consideration of smut fungi. The pathological effect of the fungus on the host plant; the preservation of the fungi within and without the host plants; a study of some of the fungi related to smuts, such as *Geminella*, *Entorrhiza*, and *Ustilaginoldea*; the present state of knowledge regarding the smut diseases; hemibasidia forms; and fruiting forms of smut fungi are discussed. Chapters are also given on the occurrence of chlamydospores and comparisons of their form in the higher and lower fungi.

Two new species of rusts, W. H. LONG (*Mycologia, 4 (1912), No. 5, pp. 282-284*).—A description is given of two parasitic fungi, one which is the type of a new genus, *Tricella acuminata* n. sp., occurring on *Coursetia glandulosa*, and the other, *Peridermium inconspicuum* n. sp., which was collected on *Pinus virginiana*.

The present state of knowledge regarding the propagation of rust, J. BEAUVERIE (*Ann. Soc. Bot. Lyon, 36 (1911), pp. 24-60*).—This is a critical review of literature prior to 1911 and a discussion of the present state of information regarding parasitism, specialization of rusts, immunity from their attacks, and the various theories regarding the propagation and wintering of rusts. A bibliography is appended.

Studies on *Corticium javanicum*, A. RANT (*Bul. Jard. Bot. Buitenzorg, 2. ser., 1912, No. 4, pp. 50, pls. 9*).—This parasite is here listed as now known on 141 species contained in 104 genera. Culture methods are here detailed and a bibliography is given. See also a previous note (*E. S. R., 25, p. 546*).

The aecidia of *Puccinia fusca*, A. F. PAVOLINI (*Bul. Soc. Bot. Ital., 1912, No. 4, pp. 90-93*).—This is a very brief discussion of the development of the aecidiospores in the case of this fungus, suggesting a further study thereof and comparative studies of other Uredineae in this respect.

Fungus diseases, J. E. HOWITT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 47-51, figs. 3*).—Notes are given on the occurrence of a considerable number of plant diseases, some of which are said to be becoming prevalent and destructive in Ontario. In addition directions are given for treatment to prevent attacks of loose smut of wheat (*Ustilago tritici*), crown rust of oats (*Puccinia coronata*), hollyhock rust (*P. malvacearum*), rose leaf

blotch (*Actinonema roseæ*), blight of ginseng (*Alternaria panax*), and sooty blotch of apples (*Leptothyrium pomi*).

Phytopathologic notes, G. ARNAUD (*Ann. École Nat. Agr. Montpellier*, n. ser., 12 (1912), No. 1, pp. 5-22, figs. 9).—The author gives the results of studies on several parasitic fungi substantially as follows:

Spharopsis pseudo-diplodia, a very variable fungus occurring on many woody plants, is considered to include properly several forms known by other names as species of *Spharopsis*, *Macrophoma*, *Diplodia*, etc. *Physalospora cydonia* is thought to be the perfect form of *S. pseudo-diplodia*. The latter is a weak parasite, attacking usually plants or parts already injured or weakened from other causes, increasing the injury, and hastening death, or else only forming cankers in case of resistant plants. The fungus is often found in relation with the work of a bark-boring beetle (*Scolytus*).

Phoma (Fusicoccum) cinerescens, the pycnidial stage of *Diaporthe cinerescens*, is said to be the only vegetal parasite seriously affecting *Ficus carica*, causing on twigs, branches, and trunk extensive cankers which slowly destroy the tree, the annual loss therefrom being important. The progress of this parasite is found to be closely related to the invasions of a minute beetle, *Hippoborus fovea*.

Glauosporium nervisequum, said to be the pycnidial form of *Gnomonia veneta*, causing anthracnose of the plane tree, produces in spring alterations along the veins of the leaf and in autumn along the borders, causing yellowing of the leaves and drying of the branches affected.

Plant pathology, E. J. BUTLER (*Ann. Rpt. Bd. Sci. Advice India*, 1910-11, pp. 112-117).—Notes are given on several diseases of the palm, soft rot of ginger (ascribed to *Pythium gracile*), a leaf disease of turmeric (said to be due to a species of *Taphrina*), a parasitic disease of the tea bush and one of tea seed, some forest tree diseases, fruit diseases, etc. A brief bibliography is appended.

Contributions to the study of straw blight of cereals, G. FÉRON (*Ann. Sci. Agron.*, 4. ser., 1 (1912), I, No. 1, pp. 3-29, figs. 3; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 4, pp. 1054-1056).—Black foot or straw blight, which has been attributed to *Ophiobolus graminis* and *Leptosphaeria herpotrichoides*, is held by the author, as the result of his studies, to be due to the latter organism. This fungus appears in May or early in June, spreading rapidly and showing as a felt-like mass on the stalks, which turn gray and finally wither. The mycelium penetrates the cells, preferring those near the vascular bundles. The black perithecia appear inside the leaf sheaths about September, and in November and December contain a large number of spores which escape in cold, dry weather and easily infect the young wheat plants. Infection of older plants is rare and difficult. The mycelium lives through the winter and in the next fall produces a still larger number of perithecia.

The incubation period is long. The spores retain their power to germinate while in the perithecia, but on escaping soon germinate or perish as they lose their vitality quickly in light (especially sunlight) and in dry air, these conditions also retarding mycelial growth. The spores were found much more resistant to iron sulphate than to the corresponding copper salt.

The author thinks that the conidia attributed to a supposedly new fungus found in May, 1906, and provisionally named *Cercospora herpotrichoides*, are the summer fructifications of *L. herpotrichoides*. The fungus requires an alkaline or a neutral medium for its development, growth being checked by very slight acidity.

Means suggested for control of this fungus include (1) late sowing (January or February); (2) selection of resistant varieties; (3) thin sowing, permitting access of light and dry air; and (4), in case of planting in drills, unequal widths between rows (narrow and wide spaces alternating).

Foot rot of grains, R. DE POLO and E. VOGLINO (*Coltivatore*, 58 (1912), No. 18, pp. 567-572, figs. 2).—The authors briefly state the results of their observations on this disease, which is said to have assumed importance in parts of Italy.

It was noted that the plants and varieties which are most forward, luxuriant, and promising in spring suffered more from the disease than did those of slower and more open growth, later maturity, and smaller yield. A series of experiments extending over several years is suggested in order to find a means of avoiding the loss which is said now to be large.

The black foot disease of wheat, L. MANGIN (*Jour. Agr. Prat.*, n. ser., 24 (1912), No. 32, pp. 174-176, figs. 3).—Under the above name the author describes a disease of wheat in which the bases of the culms are attacked. It causes a reduction in the mechanical tissues of the plant to such an extent that the wheat lodges irregularly, without reference to winds or rain. Two fungi are held to be responsible for this trouble, *Ophiobolus graminis* and *Leptosphaeria herpotrichoides*, the latter species being considered the more important in causing its development.

For the control of this disease the author recommends clearing the soil of the fungus by burning the straw, which is of little value when attacked by the fungus, treating the seed with a solution of copper and dusting with lime, fertilizing the land with superphosphate at the rate of 1,500 kg. per hectare, the use of sulphate of iron on the soil before seeding, late seeding, and a consistent system of rotation of crops.

A fungus affecting pastures in Manning River district, G. MARKS (*Agr. Gaz. N. S. Wales*, 23 (1912), No. 8, p. 682).—A brief account is given of an attack of *Phyosarum cinereum* on grasses and clovers of all classes except *Paspalum*. It destroys plants in small circular patches, ranging in diameter from a few inches to a foot or more. As its destruction is desirable it is suggested that the infected areas be covered and burned.

Potato disease, F. BASTY (*Petite Rev. Agr. et Hort.*, 18 (1912), No. 421, p. 135).—The author calls attention to the high price of potatoes due to a number of causes, among them attacks of *Phytophthora infestans*, and for its control he recommends spraying with a copper sulphate solution or with Bordeaux mixture. Two treatments are believed to be sufficient in an ordinary year, one to be made before the appearance of any disease, the other to follow after an interval of 2 weeks or more.

The effect of certain chemical substances on the vitality of the buds of potato tubers, and their disinfective action on potato blight (*Phytophthora infestans*), F. STOWARD (*Proc. Roy. Soc. Victoria*, n. ser., 24 (1911), No. 2, pp. 270-292, pls. 4).—The principal object of this investigation was to ascertain the influence, under definite conditions of time, temperature, and concentration, of certain antiseptic compounds in solution on blight-free or blight-infected tubers, particularly in regard to the annihilation of the buds of the treated tuber, and in case of blight-infected material, of the hibernating mycelium of *P. infestans*. The tubers were subjected to solutions of common salt, sulphuric acid, boric acid, carbolic acid, and formalin.

When the tubers were intact, blight free, and mature the entry of the solute during the earlier stages of immersion was chiefly if not solely by way of the buds. These were destroyed by soaking the potatoes for 10 hours in a 10 per cent solution of sulphuric acid. This was also found to destroy all the mycelium

in blight-infested tubers, entering in this case not only through the buds but through those parts of the skin which had been damaged by the fungus.

The results of the investigation indicated that the storage and cooking qualities of the tubers were not injuriously affected by the treatment.

Investigations on the root disease of sugar cane, J. R. JOHNSTON (*Porto Rico Prog.*, 3 (1912), No. 10, pp. 11, 15).—As a result of examinations of canes diseased near the root, the author thinks that there are in Porto Rico various types of root disease, only one of which, *Marasmius sacchari*, has been well worked out. Some other forms found on diseased roots are *Clathrus* sp., *Asterostroma albidocarneum*, and perhaps, *Corticium* sp., some of which may be important factors in the production of this condition.

Report of committee on root gall to the American Association of Nurserymen, E. A. SMITH (*Nat. Nurseryman*, 20 (1912), No. 8, pp. 300, 301).—A preliminary report is given of cooperative experiments that have been established by a committee of the American Association of Nurserymen, the work having been undertaken during 1911. The experiments, some of which are in cooperation with experiment stations, are now in progress in 10 different States, the object being to determine the cause and method of control of the different forms of root gall on nursery stock.

Apple blister canker and methods of treatment, W. O. GLOYER (*Ohio Sta. Circ.* 125, pp. 149-161, figs. 7).—The author describes the blister canker of apples due to the fungus *Nummularia discreta*, which is said to be quite prevalent in southern and eastern portions of Ohio. The fungus is said to be a wound parasite, and is difficult to control when once it has attacked a tree. Except in cases of slight attack the tree ultimately succumbs to the disease.

To prevent infection from the blister canker fungus the author recommends that precautions be taken to prevent the drying of the tissues following pruning or other injury. This may be done by covering the wounds with a suitable dressing, such as asphaltum, grafting wax, etc. Proper orchard sanitation, such as removal and destruction of diseased parts, is also recommended.

Bitter pit in apples, A. J. EWART (*Proc. Roy. Soc. Victoria*, n. ser., 24 (1911), No. 2, pp. 367-419).—The author conducted a series of experiments to test the theory of Miss White (*E. S. R.*, 26, p. 55) that bitter pit of apples is due to local poisoning. In his experiments a large number of inorganic, organic, and gaseous poisons were tested on the pulp of apples under varying conditions.

It was found that the ripe pulp cells of apples are more sensitive to various poisons than any other known organisms, the limit of toxic action in the case of mercuric chlorid being with a concentration of 1 to 10,000,000,000. The cuticle and bloom of sound apples were found remarkably impermeable to poisons, but when these were removed the poison penetrated readily. Young apples were found more easily penetrated by dissolved poisons than old ones, but their pulp cells were more resistant. Hence a young apple may absorb sufficient poison to kill a portion of its tissue when more mature, without any immediate toxic effect being shown.

Substances occurring normally in the soil, it is stated, may exercise a toxic effect on the fruit when presented singly, but in mixtures their individual poisonous action is decreased. The poisonous action of copper sulphate and other soluble metallic substances may be decreased by the addition of substances which decrease the percentage of free ions, and in this way it is possible to modify Bordeaux mixture and arsenate of lead without appreciably affecting their value as insecticides and fungicides. Zinc arsenite was found less poisonous than lead arsenate and is considered equally effective as an insect poison. Among the gases present in the air, ozone, ammonia, and nitric acid were found able to produce surface pitting in apples, but only in amounts and

with lengths of exposure much greater than those presented under ordinary conditions.

In conclusion the author states that he considers it established that bitter pit is, strictly speaking, not a disease but a symptom of local poisoning produced in the sensitive pulp cells of the apple, that more than one poison may produce it, and that the poisons may be derived from more than one source.

A new leaf spot fungus on pear trees in Pavia, L. MONTEMARTINI (*Riv. Patol. Veg.*, 5 (1912), No. 14, pp. 225, 226).—A brief report is made on the discovery by the author of a fungus causing a leaf spot disease of pears in Pavia. The fungus is described under the name *Hadrothricum piri* n. sp.

Grape mildew and the time necessary for infection, L. RAVAZ and G. VERCIE (*Prog. Agr. et Vit. (Ed. VEst-Centre)*, 33 (1912), No. 7, pp. 195, 196; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 4, p. 1058).—It is claimed to have been shown by these experiments that 1½ hours is sufficient time for infection to occur by fresh conidia of *Plasmopara viticola* in water on the lower side of the leaf.

Treatment of chlorosis of grape, J. VERCIE (*Prog. Agr. et Vit. (Ed. VEst-Centre)*, 33 (1912), No. 23, pp. 713, 714).—This is a very brief account of some tentative experiments in treating chlorosis of the grape with sulphate of iron. The results were encouraging and further trials are promised.

Roncet and arricciamento, E. PANTANELLI (*Coltivatore*, 58 (1912), No. 13, pp. 399-405, figs. 6).—This continues the author's previous discussion of roncet (*E. S. R.*, 25, p. 654; 26, p. 851), now noting more particularly its possible connection with another affection of the grape, occurring sporadically in Italy and known as frizzle disease. Some relations of these two abnormalities to hybridization of certain forms and to root pressure and transpiration are also noted. A later report is promised.

The spread of American gooseberry mildew in Baden, K. MÜLLER (*Ztschr. Pflanzenkrankh.*, 21 (1911), No. 8, pp. 449-454, fig. 1; *abs. in Riv. Patol. Veg.*, 5 (1912), No. 14, pp. 227, 228).—A discussion is given of the first appearance in 1908 of *Sphaerotheca mors-uvæ* and of its later appearances in parts of Baden. It is claimed that all outbreaks originated where stock brought from other sections had been planted and that the spread from wind-borne conidia in summer is of only local importance.

Stem-end rot and gummosis, H. S. FAWCETT (*Proc. Fla. State Hort. Soc.*, 24 (1911), pp. 41-52, pl. 1).—A summary account is given of the investigations carried on by the author while at the Florida Station on stem-end rot, due to Phomopsis, and gummosis, caused by *Diplodia natalensis*, previous notes upon them having been given elsewhere (*E. S. R.*, 25, p. 450; 26, p. 449).

Some fruit diseases, J. B. RORER (*Dept. Agr. Trinidad and Tobago Bul.*, 11 (1912), No. 70, pp. 75, 76).—Descriptions are given of anthracnose of the mango due to *Glaeosporium mangiferae* and anthracnose of the avocado caused by *Colletotrichum* sp. It is said that both of these diseases can be controlled by spraying with Bordeaux mixture if the work be thoroughly done and started in good season.

Banana diseases are briefly described, the two most prevalent troubles being the Panama and moko diseases. The Panama disease is believed to be due to a species of *Fusarium*, while the moko disease is apparently of bacterial origin. It is stated that the varieties of banana subject to one disease are apparently quite resistant to the other.

Spraying cacao, J. B. RORER (*West Indian Bul.*, 12 (1912), No. 3, pp. 27-277; *Dept. Agr. Trinidad and Tobago Bul.*, 11 (1912), No. 70, pp. 34-36).—In order to ascertain whether cacao diseases, and particularly the canker and black pod rot, due to *Phytophthora foberi*, can be controlled by spraying, the

author conducted a series of experiments on a block of 1,000 trees divided into two equal parts, one of which was sprayed with Bordeaux mixture while the other was left unsprayed.

At harvest all fruits were carefully examined and the results show conclusively that spraying cacao is an efficient method for controlling the diseases. Allowing for labor, materials, etc., a gain of over \$20 from 500 trees was reported in a single season.

Cacao canker, E. Eason (*West Indian Bul.*, 12 (1912), No. 3, pp. 302-308).—The results of a six months' study of cacao canker in Surinam have led the author to the belief that the disease is not primarily due to *Phytophthora*, as has been claimed by Rorer (*E. S. R.*, 23, p. 748), but is to be attributed to attacks of *Spicaria colorans*, as previously described by A. E. van Hall de Jonge (*E. S. R.*, 22, p. 547).

A possible inference to be drawn from the studies on cacao canker, A. FERNHOLM (*West Indian Bul.*, 12 (1912), No. 3, pp. 308-310; *Dept. Agr. Trinidad and Tobago Bul.*, 11 (1912), No. 70, pp. 46-48).—The author is disposed to criticize the claim of Rorer (*E. S. R.*, 23, p. 748) that pod rot, canker, and chupon wilt of cacao is solely due to *Phytophthora* sp. He considers canker as a condition and not a specific disease and that several parasitic fungi attacking cacao trees may produce cankerous conditions.

Fungus diseases of cacao, F. W. SOUTH (*West Indian Bul.*, 12 (1912), No. 3, pp. 277-302).—Popular descriptions are given of the principal diseases of cacao known to occur in the West Indies and contiguous regions. A bibliography of references is given.

Bad rot of the coconut palm, J. B. RORER (*Dept. Agr. Trinidad and Tobago Bul.*, 11 (1912), No. 70, pp. 68, 69).—The disease of the coconut palm attributed by Johnston (*E. S. R.*, 23, p. 649) to *Bacillus coli* is described. This disease appears to be quite prevalent in Trinidad, and sanitary measures have been taken to prevent its spread, about 18,000 trees having been destroyed. Since this work has been done there has been a marked reduction in new cases of infection, and the author claims that this indicates rather conclusively that the disease can be held in check by these measures, provided they are widely enforced.

Rows of spots on the leaves of palmyra palms, W. McRAE (*Agr. Jour. India*, 7 (1912), No. 3, pp. 272-279, pls. 5).—The author describes a form of disease in the leaves of palmyra palm that is due to the fungus *Pythium palmivorum*, the cause of the bud rot of this tree.

The parts of this palm most susceptible to attack are the succulent yellow parts of the leaf sheaths. When the fungus begins its attack, well above the level of the growing point, it eats its way inward through the leaf sheaths until it reaches the young expanding leaves. The tissues of the leaves are then attacked, the fungus boring holes through them which become quite evident upon the expansion of the leaves.

Cutting out the affected leaves is recommended as probably the most satisfactory method of dealing with this trouble.

A preliminary note on the heredity of fungus diseases of certain plants, L. BLARINGHEM (*Bul. Soc. Bot. France*, 59 (1912), No. 2-3, pp. 217-220).—A record is given of observations on *Lolium temulentum*, which is often attacked by a fungus; *Althaea rosea*, the seeds of which are commonly infected with *Puccinia malvacearum*; and *Oenothera nanella*, which is claimed to be a dwarf form of *O. lamareckiana*, attacked by a *Micrococcus*. From the frequency of the occurrence of these diseases on their host plants, the author thinks the relation of symbiosis has become an acquired character.

The case of *Lolium temulentum* and *Althaea rosea*, S. BUCHET (*Bul. Soc. Bot. France*, 59 (1912), No. 2-3, pp. 188-191).—The author discusses the sup-

posed dependence of *L. temulentum* and *rosea* on the symbiotic fungi which commonly infest them. He claims that they may and do exist absolutely independently of their fungus symbionts without changing their character in any degree. He holds that the necessary dependence of the host on the fungus does not exist.

Stem rot of carnations, M. A. BLAKE and A. J. FARLEY (New Jersey Sta. Rpt. 1910, pp. 78-81).—Severe losses due to stem rot of carnations have been reported by florists in several parts of the State. It has been found that the disease is especially severe upon plants that are bruised or injured in cultivation or during the process of benching. The stations have carried on experiments to determine means by which the losses can be reduced, and red shale soil has been studied with a view to its adaptability for the growing of carnations. The results of a test of this soil mixed with different proportions of sand and with and without composted manure are described.

The results indicate that the addition of composted manure to soils of the red shale type intended for the forcing of carnations increases the danger of loss by stem rot, also that the addition of considerable sand with the composted manure further increases the danger of loss. The stations have succeeded in growing carnations successfully upon red shale soil without the use of composted manure, and if proper physical conditions of the soil can be secured and chemical fertilizers used, it is believed that there will be little danger of loss from fungus diseases.

Foot rot of carnations, L. FONDARD (Petite Rev. Agr. et Hort., 18 (1912), Nos. 416, pp. 80, 81; 418, p. 103; 420, p. 128).—This is a brief synthetic discussion based on investigations conducted mainly by others.

This disease, known also as root disease, branch disease, etc., and found mainly in the coastal region of France, though also occurring in other parts, is ascribed to a fungus, *Fusarium dianthi*, which may manifest itself in and near the roots or in other and all parts of the plant. It is said to be perpetuated either by mycelium carried in the cuttings and developing with these, or by spores, some of which are thought to live for one or more years on debris and roots in soil and to be carried to sound plants by the operations of cultivation, by manures, and especially by irrigation with a strong dashing stream of water.

As preventive measures, the most critical examination of cuttings is recommended, also rotation of plants so as to give time for all spores to die in the soil.

A disease of the leaves of the garden geranium, ALI RIZA (Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 2, pp. 148-150, figs. 2).—The author describes a disease of the leaves of the garden geranium (*Pelargonium peltatum*) which is attributed to *Coniothyrium trabuti* n. sp. A technical description of the fungus is given.

An anomaly of *Pelargonium capitatum*, P. BACCARINI (Bul. Soc. Bot. Ital., 1912, No. 4, pp. 67-74, fig. 1).—The author gives a description of certain excrescences observed on this plant and an account of his studies as to their origin and real nature. Regarding these, however, he offers as yet no very decided opinions.

***Polystictus versicolor* as a wound parasite of catalpa, N. E. STEVENS (Mycologia, 4 (1912), No. 5, pp. 263-270, pls. 2).**—During 1911-12 the author has investigated the wood rots of catalpa in Kansas, particularly with reference to second growth stands.

It has been found that the most serious wood rot of living catalpa is caused by *P. versicolor* and that coppice shoots on partly decayed stumps are less

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readily infected than are branches of a partly decayed trunk. In examining the diseased material tyloses were found abundant in the outer wood, and there is apparently a constant relation between the presence of the decayed area in the trunk and their formation. In addition to the above species, the author frequently found fruiting bodies of *Trametes septum* on catalpa stumps.

Diseases of the chestnut and other trees, H. METCALF (*Trans. Mass. Hort. Soc.*, 1912, pt. 1, pp. 69-95).—This is an address presented before the Massachusetts Horticultural Society in which an outline account is given of various forest tree diseases, particular attention being paid to the chestnut bark disease (*Diaporthe parasitica*). The relation of the disease to the condition of the tree is discussed, and outlines are given of methods for control, together with the proposed program for combating the disease and preventing its spread.

A bibliography is appended.

Oak Oidium in France, G. TRINCHIERI (*Bul. Soc. Bot. Ital.*, 1912, No. 4, pp. 100-102; *Jour. Agr. Prat.*, n. ser., 23 (1912), No. 13, pp. 402, 403).—This is a brief discussion of the contribution on this subject made by Arnaud and Foëx (*R. S. R.*, 26, p. 551). The present author holds that a more complete comparison and experimental data are necessary before the oak Oidium of Europe can be safely considered as identified with the American species, *Microsphaera quercina*.

Uredo mammothi injurious to *Manihot glaziovii* in Brazil, E. ULE (*Tropenpflanzer*, 18 (1912), No. 2, pp. 91-95; abs. in *Internat. Inst. Agr.* [Rome], *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 4, p. 1065).—The author reports that this fungus was found by him to attack rubber trees in the State of Ceará and neighboring regions, causing rust-colored spots on the leaves and large excrescences and witches' brooms on twigs and branches, reducing the yield of rubber, killing the branches, and eventually destroying the trees affected.

Careful pruning out and burning all diseased parts is said to be the only remedy yet found effective.

Prevention of mold, G. G. HEDCOCK (*Chicago* [1912], folio).—This paper, which was read before the National Slack Cooperage Manufacturers' Association, St. Louis, Mo., May, 1911, gives a brief report on 10 experiments running from 1905 to 1910.

It was found that for the treatment of lumber sodium bicarbonate at a strength of 5 to 8 per cent is, on the whole, the most economical and satisfactory. Some other compounds, notably potash alum and corrosive sublimate, either have not been fully proved or are too dangerous to be unqualifiedly recommended. Kiln drying is stated to be the best preventive of stain due to mold.

The spreading qualities of spraying mixtures, J. WEINMANN (*Prog. Agr. et Vét. (Ed. l'Est-Centre)*, 33 (1912), No. 23, pp. 709-712).—This is an account of a series of experiments on the wetting capacity of Bordeaux and Burgundy mixtures with addition of various substances to lower the surface tension and permit greater spreading on the surface treated therewith.

It was found that for the purpose in view ordinary white soap was as effective as a specially prepared soap sold in the form of powder. Polysulphids without soap do not augment the wetting capacity of the mixture, but the two together added to neutral or alkaline Burgundy mixture give excellent results. Sapiindus alone was found to give results almost equal to soap alone but inferior to a mixture of the two.

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Dictionary of biology, H. SCHMIDT (*Wörterbuch der Biologie*. Leipzig, 1912, pp. VIII+581).—An illustrated biological dictionary.

Mice: Their breeding and rearing for scientific purposes, J. F. DANIEL (*Amer. Nat.*, 46 (1912), No. 550, pp. 591-604, figs. 4).—The author describes an intensive method by which he has been able to rear mice in abundance.

The rat and its relation to public health (Washington: Pub. Health and Mar. Hosp. Serv. U. S., 1910, pp. 254, pls. 9, figs. 59).—The subject is here dealt with by a number of authors, as follows: Natural History of the Rat, by D. E. Lantz (pp. 15-27); Plague Infection in Rats, by G. W. McCoy (pp. 29-48); Rat Leprosy, by W. R. Brinckerhoff (pp. 49-53); Bacterial Diseases of the Rat, other than Plague and Rat Leprosy, by D. H. Currie (pp. 55-57); Organic Diseases of the Rat, including Tumors, by G. W. McCoy (pp. 59-68); The Ectoparasites of the Rat, by N. Banks (pp. 69-85); The Internal Parasites of Rats and Mice in Their Relation to Diseases of Man, by C. W. Stiles and C. G. Crane (pp. 87-110); Compendium of Animal Parasites Reported for Rats and Mice, by C. W. Stiles and A. Hassall (pp. 111-122); The Flea and Its Relation to Plague, by C. Fox (pp. 123-144); Rodents in Relation to the Transmission of Bubonic Plague, by R. Blue (pp. 145-152); Rodent Extermination, by W. C. Rucker (pp. 153-162); Natural Enemies of the Rat, by D. E. Lantz (pp. 163-169); Rat Proofing as an Anti plague Measure, by R. H. Creel (pp. 171-178); The Inefficiency of Bacterial Viruses in the Extermination of Rats, by M. J. Rosenau (pp. 179-204); Plague Eradication in Cities by Sectional Extermination of Rats and General Rat Proofing, by V. G. Heiser (pp. 205, 206); The Rat in Relation to Shipping, by W. C. Hobdy (pp. 207-213); The Rat as an Economic Factor, by D. E. Lantz (pp. 215-226); and The Rat in Relation to International Sanitation, by J. W. Kerr (pp. 227-254).

Methods of estimating the contents of bird stomachs, W. L. McATEE (*Auk*, 29 (1912), No. 4, pp. 449-464).—This is a general discussion of methods, called forth by the decided opinions on the merits of the numerical and the percentage-by-bulk methods of estimating the contents of bird stomachs expressed in a work previously noted (*E. S. R.*, 27, p. 52).

The author points out that "the principal objection to the method of reckoning the contents of bird stomachs solely by the number of individual insects or seeds, is that the method takes no account of size of the objects, and hence conveys no idea to those unacquainted with the groups concerned of the relative importance of the food elements. Size has much to do with economic status—i. e., capacity for good or harm—and it receives proper recognition only under the percentage-by-bulk system. . . .

"Numerical notations in most cases greatly exaggerate the importance of elements of the food that have parts very resistant to digestion, a difficulty which is reduced to the minimum when proportions are estimated according to the volume.

"Numerical systems are not sufficiently comprehensive. Finely comminuted, fleshy, or pulpy food, or food occurring in indefinite masses can not be reckoned by numbers. Under the percentage-by-bulk system, all food can be included in the computations. . . . The ideal system from the writer's point of view is one that combines the good points of both the numerical and volumetric methods—a system which, as a matter of record, counts individuals as far as possible, or at least in enough instances to assure the inclusion of typical cases and which further estimates the proportion of all important items by bulk."

Report of the entomologist, J. E. SMITH (*New Jersey Stat. Rpt.* 1910, pp. 299-378, pls. 7, fig. 1).—During the course of nursery inspection a new method

moth, which has since been described as *Plachoryctis tsugensis*, was found in some numbers on Japanese hemlock. A scale insect, similar in size and appearance to the San Jose scale, but which appears to be undescribed, was also found on Japanese hemlock. Mention is made of the possibility that the European red-tail (*Dasyctira pudibunda*), a moth widely distributed in continental Europe and parts of Asia which frequently defoliates entire forest areas and is recognized as a first-class pest, ranking with the gipsy and brown-tail moths, has obtained a slight foothold in this country. This moth, which was first collected in Bergen County, N. Y., in 1908; was also taken in 1909, but was not met with during the inspections of 1910. It is a general feeder on deciduous trees of all kinds but favors the beech. Mention is also made of the collection of a European coccinellid in one nursery. Among the other insects mentioned are the shot-hole borer, which was the source of considerable injury to peach trees; the grape-berry moth, which was unusually injurious; the pear psylla; and the pear midge, of which there was quite an unexpected recrudescence. A slight infestation of Lawrence pears by the pear midge resulted in the maturing in a twisted and deformed shape. In the opinion of the author the San Jose scale is on decline so far as its destructiveness is concerned.

The strawberry weevil was the source of considerable injury in Cumberland County and some sections of Cape May County. Observations and experiments with the peach borer and plum curculio are reported. Among the apple insects mentioned are the apple leafhopper, codling moth, yellow-necked caterpillar, and green apple worm (*Xylina* sp.).

Shade and forest insects, the occurrence of which is mentioned, include the elm leaf beetle; elm plant louse; white-marked tussock moth; maple false scale (*Pseudococcus aceris*); cottony maple scale; tulip soft scale (*Lecanium tulipifera*); a leaf beetle (*Lina scripta*) on poplar, which was unusually destructive in nurseries and defoliated many of the smaller trees; the hickory bark beetle; bronze birch borer (*Agrilus ansius*); two-striped chestnut borer (*A. bilineatus*); giant root borer (*Prionus laticollis*); golden oak scale (*Asterolecanium quercicola*); periodical cicada; Chermes on conifers; etc.

Brief notes are also presented on the several insects injurious to field crops. Root-maggot observations, by E. L. Dickerson (pp. 353-358), are incorporated in the report. Root maggots were found during the year to develop in wild radishes, thus indicating the desirability of keeping these plants in check. All the specimens reared to adults from wild radishes were *Pieris brassicae*. Indications point to the fact that while some of the flies live through the winter and oviposit in the spring, hibernation may take place in any of the larval or in the pupal stage. The Chinese mantid (*Tenodera sinensis*) was found at several points in the State where it had been introduced.

Under the heading of insecticides, analyses made of the brands of arsenate of lead offered for sale in the State are reported. A brief account is also given of tests of atomic sulphur, arsenate of iron, blackleaf 40, Neco-sul, and soluble oils, including vacuum oil, Carbolene, Scalecide, U-neck mixture, Spray-on Scale-off, and soluble paraffin.

[Sixth annual report of the department of entomology and zoology], G. J. S. BETHUNE (Ontario Agr. Col. and Expt. Farm Rpt. 1911, pp. 25-43).—The author mentions the occurrence in the Thunder Bay district of an army of black cutworms, which devoured vegetation of all kinds and completely destroyed the crops attacked; the serious infestation of grain bins by the saw-toothed grain beetle (*Sitona surinamensis*); the work of the predaceous bugs *Pentatomus bicoloratus* and *P. claudus*, which in both adult and nymph stages feed upon the eggs, larvae, and mature forms of the Colorado potato beetle and in

some localities almost entirely destroy it; the occurrence of the cotton moth (*Alabama argillacea*); and of the subtropical moth *Eryobus odora*, specimens of which were collected in Canada.

Biological observations in Europe reported by T. D. Jarvis (pp. 30-38) and a brief report of investigations by L. Cæsar (pp. 38-43) complete the report.

Third annual report of the state entomologist of Colorado for the year 1911, C. P. GILLETTE (*Ann. Rpt. Bd. Hort. Colo., 1911, pp. 99-169, pls. 5*).—This is a detailed account of the horticultural inspection work in Colorado. A report of analyses of samples of arsenate of lead and arsenite of zinc, and of state bee inspection for the year 1911 by W. Foster, are appended.

Seventh annual report of the state entomologist and plant pathologist for 1911, G. M. BENTLEY (*Ann. Rpt. State Ent. and Plant Path. Tenn., 7 (1912), pp. 60, figs. 20*).—A detailed report of the work of the year.

Amended law creating the Tennessee State Board of Entomology: Amended rules and regulations: Apiary inspection law (*Tenn. Bd. Ent. Bul. 6, 1912, pp. 63*).—The texts of these laws and rules and regulations are brought together.

The inspection and transportation of nursery stock in Tennessee, other States, and Canada, G. M. BENTLEY (*Tenn. Bd. Ent. Bul. 7, 1912, pp. 31, figs. 7*).—This bulletin has been prepared in response to inquiries concerning the inspection and shipment of nursery stock in the different States and Canada. It gives the names and addresses of the officials having the work in charge and contains revisions of the laws to July, 1912.

[Report of the entomologist], W. W. FROGGATT (*Rpt. Dept. Agr. N. S. Wales, 1911, pp. 52-55*).—This is a brief report of the work of the year and includes an account of the occurrence of the more important insects.

Fall manual of practice in economic zoology, H. A. GOSSARD (*Ohio Sta. Bul. 233, pp. 53-164+VII, figs. 18*).—This is the third of a series, of which the winter and spring numbers have been previously noted (*E. S. R., 20, p. 1048*). The general principles of practice are first discussed. Under the heading of farm treatment, the author considers the various enemies of field crops and remedies therefor (pp. 58-88). Enemies of orchard and small fruits and remedial treatment are discussed under the heading of orchard practice (pp. 88-151). The bulletin concludes with tabular data as to the insects of the vegetable garden.

Insect enemies of the avocado, P. CARDIN (*Estac. Expt. Agron. Cuba Circ. 42, 1912, pp. 32-36*).—The more important insect enemies of the avocado in Cuba are the bagworm *Oiketicus poeyi*, a leaf roller, the coconut scale (*Aspidiotus destructor*) and an undetermined species of the same genus, and a leaf-cutting ant (*Atta insularis*).

Technical papers on miscellaneous forest insects.—V, A preliminary synopsis of cerambycid larvæ, J. L. WHEB (*U. S. Dept. Agr., Bur. Ent. Bul. 20, pt. 5, tech. ser., pp. 149-155, pl. 1*).—In the preparation of the table of the superfamily Cerambycoidea, the author has studied the larvæ of 46 genera of the superfamily Cerambycoidea; 15 being in the family Lamelidæ, 18 in the family Cerambycidæ, 5 in the family Lepturidæ, 5 in the family Prionidæ, and 3 in the family Asemidæ. He proposes the raising of the primary groups Prionini, Asemini, Cerambycini, Lepturini, and Lamelini to family rank.

Relation of insects to the death of chestnut trees, A. D. HOPKINS (*Amer. Forestry, 18 (1912), No. 4, pp. 221-227, pls. 4*).—The author states that 472 insect enemies of chestnut trees have been listed, but that the so-called two-lined chestnut borer is deemed as important as all the others combined. This beetle is on the wing in May and June and deposits its eggs on the bark of

living and dying chestnut, oak, beech, and ironwood in the Southern, Middle, and Eastern States. The larvæ mine in the inner bark and outer wood in such a manner as to girdle the trees.

It is pointed out that insects are more or less responsible for primary wounds through which the spores of the chestnut blight disease find entrance to the living tissue.

Insects bred from cow manure, F. C. PRATT (*Canad. Ent.*, 44 (1912), No. 6, pp. 180-184).—This annotated list, which is supplementary to that published by L. O. Howard in 1901, contains 31 species of Diptera, 17 of Coleoptera, and 1 of Lepidoptera.

[Lime-sulphur wash and lead arsenates], R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt.* 1911, pp. 85, 86).—In continuation of investigations of the effect of adding lime to lime-sulphur, the author confirms the results previously obtained (*E. S. R.*, 25, p. 506), finding that there is no objection whatever to the practice of adding lime to lime-sulphur spray, provided the lime is not put in until after the necessary quantity of water has been added to the concentrate to dilute it to the required strength. Analyses of 9 of the more common commercial brands of lead arsenate on the market are reported.

The Minnesota flytrap, F. L. WASHBURN (*Minn. State Ent. Circ.* 24, 1912, pp. 3, figs. 3).—A successful device for catching flies in enormous numbers, which has recently been constructed and put to a practical test by the Minnesota Station, is described and illustrated.

Locusts and some of their parasites (*Bol. Min. Agr. Indus. e Com.* [Rome], Ser. C, 11 (1912), No. 2-3, pp. 30-52, figs. 25).—This paper records observations, made in 1910-11 during an invasion of the Province of Palermo, Sicily, by *Docostaurus* (*Stauronotus*) *maroccanus*. The insect and other parasites of locusts are discussed and references given to the literature.

The control of thrips on tomatoes, J. R. WATSON (*Pla. Grower*, 6 (1912), No. 9, pp. 4, 5).—An outbreak of thrips (*Euthrips tritici*) over most of Florida occurred in the spring of 1912, the most serious injury being done in tomato fields and citrus groves.

"The young upon hatching at once attack the tenderest part of the blossom or bud. . . . This turns black and shrivels up. Soon afterwards the whole flower turns yellow and falls off. If this is repeated for all the blossoms on the first 3 or 4 stands (as was often the case this year) the crop is ruinously shortened."

A mixture consisting of commercial lime-sulphur 2½ qt., black-leaf 40 3¼ fluid ounces, and water 50 gal., which has been used effectively against the orange thrips in California, was applied during April, 1912, and killed about 75 per cent of the thrips present.

A new genus and three new species of North American Thysanoptera, J. D. HOOD (*Psyche*, 19 (1912), No. 4, pp. 113-118, pls. 2).—*Heliothrips phaseoli*, one of the species here described as new, is reported as very injurious in 1908 to beans in the region of Brownsville, Texas. "Its ravages were so severe that the plants became yellowish and the crop was greatly diminished. Across the Rio Grande in Mexico, near Matamoros, it was found on a species of wild bean which grew along the river bank; and for this reason it would appear that the species is a native one which has lately turned its attention to the cultivated bean."

Some considerations in regard to the classification of the order Thysanoptera, R. S. BAENAIL (*Ann. and Mag. Nat. Hist.*, 8, ser., 10 (1912), No. 56, pp. 220-222).—The author erects the new suborder Polystigmata for the reception of the family Urothripidae.

Papers on deciduous fruit insects and insecticides.—Spraying experiments against the grape leafhopper in the Lake Erie Valley in 1911. F. JOHNSON (*U. S. Dept. Agr., Bur. Ent. Bul. 116, pt. 1, pp. 13, pls. 3, figs. 3*).—This is a report of experiments conducted during 1911 in continuation of those previously noted (*U. S. R.*, 25, p. 152). Owing to the more rapid development of the immature stages of this insect in 1911 than in 1910 there was a partial second brood of considerable proportions in 1911, which greatly augmented the injury toward the ripening season.

Two forms of commercial tobacco extract were used in the experiments, the first (blackleaf extract), containing 2.7 per cent nicotine; the second (blackleaf 40), containing 40 per cent nicotine sulphate. The first, used at a dilution of 1 part of extract to 150 parts water, killed all nymphs that were thoroughly wet with the spray, especially the smaller nymphs, between the first and fourth molts. The second was effective at a dilution of 1 part extract to 1,500 parts water.

"The field experiments made during the season . . . show that a single application of the tobacco extracts applied against this insect in the nymphal stage as a contact spray will reduce its numbers to such an extent that the infested vines will remain in good foliage throughout the season and mature a crop of high-quality fruit.

"As indicated by the variation in the time and rapidity in development of the nymphs in 1910 and 1911, it is evident that no definite date for making the spray application can be given. Where the winged adults are at all numerous in the early part of the season the vineyardist is urged to examine the underside of the grape leaves toward the middle and the end of June and to observe the number and size of the nymphs. The spray application to be most effective should be made at about the time the first nymphs to hatch are near the last molt. This is indicated by the length of the wing pads. At this time the underside of badly infested leaves will be covered by the nymphs in all stages of development. Generally speaking, this condition is likely to occur in the Lake Erie Valley from July 1 to 15. All of the field experiments conducted in 1910 and 1911 were made between these dates and in every instance very satisfactory results were secured."

The aphids attacking Ribes, with descriptions of two new species. F. V. THEOBALD (*Jour. Econ. Biol.*, 7 (1912), No. 3, pp. 94-116, pls. 2, figs. 14).—Seven species which attack cultivated and wild currants and gooseberries are dealt with, namely, *Aphis grossulariae*, *Macrosiphum lactuce*, *Rhopalosiphum lactuce*, *R. britteni* n. sp., *Myzus ribis*, *M. whitei* n. sp., and *Schizoneura ulmi*.

Recent results of spraying experiments for the control of the white fly on citrus. W. W. YOTHERS (*Proc. Fla. State Hort. Soc.*, 24 (1911), pp. 53-64).—This paper gives further information as to the value of the formulas previously recommended (*U. S. R.*, 25, p. 153) when used in combating the white fly.

The biology and the treatment of the eudemis and cochylys moths in 1911. J. CAPUS (*Rev. Vit.*, 37 (1912), Nos. 959, pp. 593-606; 960, pp. 633-638; 961, pp. 631-636; 962, pp. 707-712; 964, pp. 773-778; 965, pp. 818-821; 966, pp. 846-851).—This article reports investigations of the biology of and remedial measures for the cochylys and eudemis moths.

A fungus disease of bagworms (*Isaria psychidae*). I. B. P. EVANS (*Afr. Jour. Union So. Africa*, 4 (1912), No. 1, pp. 63-67, fig. 1).—The author's studies show that the fungus *I. psychidae* caused a disease among the bagworms from which, when once infected, there was no chance of recovery. Experiments conducted in the laboratory showed that if healthy bagworms were fed on wattle leaves contaminated with the spores or germs of the fungus, the insects contracted the disease in from 4 to 5 days' time and were dead at the end of 7 to

10 days. In less than a month's time the characteristic white fungus cushions had appeared and pushed their way through the bags to the exterior. The results thus far obtained indicate that the pest may be greatly diminished by the use of this fungus.

On the history of the nonne disease, C. VON TUBEUF (*Naturw. Ztschr. Forst- u. Landw.*, 8 (1911), No. 8, pp. 357-377).—This is a review of investigations made of the wilt disease of the nun moth.

Report on the mosquito work for 1910, J. B. SMITH (*New Jersey Stas. Rpt.* 1910, pp. 877-924, pls. 3, fig. 1).—This is a somewhat detailed report of the work of the year, and includes reports on local conditions and on *Azolla* investigations previously noted (*E. S. R.*, 24, p. 582). Brief notes on the habits of certain mosquitoes are appended.

Fruit fly campaign, W. M. GIFFARD (*Hawaii. Forester and Agr.*, 9 (1912), No. 3, pp. 236-239).—A peculiar condition affecting a large percentage of mango fruits during the present season, at first supposed to have been due to the attack of the Mediterranean fruit fly, has been found to be caused by the mango weevil. The attack of this weevil, which has been exceedingly prevalent throughout Honolulu, is said to bring about fermentation and subsequent rotting of the fruit.

Fannia (*Homalomylia*) *canicularis* and *F. scalaris*, C. G. HEWITT (*Parasitology*, 5 (1912), No. 3, pp. 161-174, pl. 1, figs. 7).—This is an account of the bionomics and of the larvae of these flies and their relation to myiasis of the intestinal and urinary tracts.

Life history and habits of the "Cayor worm," the larva of *Cordylobia anthropophaga*, an African muscid, E. ROUBAUD (*Compt. Rend. Acad. Sci. [Paris]*, 153 (1911), No. 17, pp. 780-782; *obs. in Science*, n. ser., 35 (1912), No. 904, pp. 662, 663).—A report of biological studies of a dipterous larva of which is a cutaneous parasite.

A catalogue of the Coleoptera (*Coleopterorum Catalogus*, Berlin, 1911, pts. 37, pp. 587-742; 38, pp. 100; 1912, pt. 39, pp. 574).—In continuation of this work (*E. S. R.*, 26, p. 560), part 37, by H. Gebien, completes and indexes the subfamilies, genera, and subgenera of Tenebrionidae, and also catalogues the Trictonotomidae; part 38, by J. J. E. Gillet, catalogues the Scarrabæid subfamily Coprinæ, I; and part 39, by C. Aurivillius, the subfamily Cerambycinae.

Annual report of the Bee-Keepers' Association of the Province of Ontario, 1911 (*Ann. Rpt. Bee-Keepers' Assoc. Ontario*, 1911, pp. 103).—This report consists of the proceedings of the association.

The lore of the honeybee, T. EDWARDS (*New York*, 1911, pp. XIX+196).—A popular work.

The life history of *Nosema apis*, and the significance of the various stages of the parasite in the disease, H. B. FANTHAM and ANNIE PORTER (*Jour. Bd. Agr. [London]*, 19 (1912), No. 2, Sup. 8, pp. 57-78, pls. 3).—The life cycle of *N. apis* in the adult bee is summarized by the authors as follows:

"When the spore is taken up mixed with food, it generally passes forwards into the chyle stomach of the bee before much change occurs in it. Within the chyle stomach the spore-wall is softened by the action of the digestive juice of the bee, which penetrates to the spore contents. Stimulated by the juice, the sporoplasm apparently presses the vacuole, with the result that the polar filament is forcibly ejected. It serves for a short time as an organ of attachment, fixing the spore to the gut wall. The sporoplasm concentrates and moves forwards, whereby the polar filament is forced still farther outwards, and becomes disconnected from the spore. The sporoplasm, retaining 2 of the nuclei, creeps out from the sporocyst, leaving the 2 sporocyst nuclei behind. The free sporoplasm becomes amoeboid. The binucleate amoebula creeps about over the in-

intestinal surface. The nuclei may fuse, or more often, the amoebula proceeds to form daughter amoebula. The final active amoebulae are small, roundish organisms, each with a single nucleus containing a karyosome. Each amoebula is capable of "amoeboid movement." It penetrates the cells of the gut, or else between them, and finally either enters one of the cells or goes beyond and floats in the hæmocoelic fluid.

"Assuming that it enters an epithelial cell of the gut, it becomes rounded and passive therein, and after a period of growth, during which time it is known as a trophozoite, commences to multiply by several methods. There results usually a collection of separate daughter individuals or meronts, or chains of meronts. The chain condition is somewhat less common than the separate forms in our experience so far. Each meront is uninucleate. Alternatively, a meront may form a large, multinucleate body, in which cleavage into daughter meronts does not occur. Such bodies may be intercellular or intracellular.

"After a period of active growth and division producing uninucleate meronts, spore formation begins. The organism is now called a pansporoblast. Active amitotic nuclear division occurs, resulting in the production of 5 nuclei. Two vacuoles also form in the developing spore, a large one at one end called the posterior vacuole, and a small one at the opposite end, forming the polar capsule. The living body substance or sporoplasm then forms a somewhat ring-shaped mass between the 2 vacuoles, and in it are lodged the 5 nuclei arising by division from the meront nucleus. Two migrate to the sides. These become elongated, and may be termed the sporocyst nuclei. Of the other 3 nuclei, 1 controls for a time the polar capsule, and the other 2 the sporoplasm. The polar capsule gradually forms the spiral polar filament, which extends down into the posterior vacuole. While these nuclear changes are taking place in the sporoblast or young spore, the latter is forming a coat around itself. This spore coat or sporocyst gradually thickens and obscures the nuclei beneath, and the final result is that from one pansporoblast a single spore, resembling a rice grain in shape, with a shining refractile sporocyst is produced. In this condition the spore passes into the lumen of the gut, is voided with the feces, and remains a source of infection for some time.

"It will thus be realized that there are 2 distinct phases in the life cycle of *N. apis* within the bee. This feature *Nosema* holds in common with other protozoal parasites, such as the coccidium fatal to game birds and poultry. The first part of the life of *Nosema* is occupied in growth and active division, so that the number of parasites within the host is enormously increased. This multiplicative stage, known as merogony, is the one that is most dangerous to the host. The young stages of the parasite alone are sufficient to kill the bee in many cases, and the parasite as a result may never reach the final or spore stage of its development. Young grouse similarly are killed by the multiplicative stages (merozoites) of *Eimeria* (*Coccidium*) *avium*.

* "When the power of the parasite to multiply more in the one host is exhausted or when the bee can no longer supply it with sufficient food, it becomes necessary for the *Nosema* to leave its host and to renew its development in a new one. Consequently, the parasite must protect itself in order to survive the period between leaving one host and entering the next. As a result of this need the parasite forms a hard outer covering or spore coat, and becomes a spore. The spores are highly resistant to outside conditions, can live for some time without losing their infective power, and so can become new sources of infection for other bees. In other words, merogony of *N. apis* serves for the infection of, and has fatal effects on, a single host; sporogony is a means for the spread of the disease to new hosts."

The authors consider it probable that the cycle in the larvae follows on exactly the same lines as in the adult.

The morphology and life history of *Nosema apis* and the significance of its various stages in the so-called Isle of Wight disease in bees (*Microsporidiosis*), H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par.*, 6 (1912), No. 2, pp. 163-193, pls. 1, fig. 1).—The information here presented is included in the article above noted.

The ways in which the disease [*Nosema apis*] may be spread, G. S. GRAHAM-SMITH and G. W. BULLAMORE (*Jour. Bd. Agr. [London]*, 19 (1912), No. 2, Sup. 8, pp. 95-116, fig. 1).—"We have shown that the infection may be transmitted through the agency of infected foods or of living infected bees. Infected water, especially rain water grossly contaminated with excrement in the vicinity of hives, and honey, present in hives in which bees have died, seem to be the most important infected foods. Foraging bees infected by ingesting these foods, and 'parasite carriers,' whether queens, drones, or workers, are the most important agents of infection. The latter may be present in stocks which have never suffered from the disease, or in dwindling stocks showing few symptoms, or in stocks which have suffered from the disease and apparently recovered."

The dissemination of *Nosema apis*, H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par.*, 6 (1912), No. 2, pp. 197-214, figs. 2).—This article is based upon the paper noted above.

The relation of *Nosema apis* to the Isle of Wight disease, G. S. GRAHAM-SMITH, H. B. FANTHAM, and ANNIE PORTER (*Jour. Bd. Agr. [London]*, 19 (1912), No. 2, Sup. 8, pp. 33-56, pl. 1).—"Taking into consideration the following facts, namely, that *N. apis* is met with in 84 per cent of stocks reputed to be suffering from the disease, that infection experiments have proved that the parasite produces a fatal disease in bees, that very marked destruction of the tissues of the alimentary tract is found in severely infected specimens, whether the condition has been produced experimentally or naturally, and that in less marked infections a high proportion of the cells lining the alimentary tract are invaded by the parasites and injured, the writers consider themselves justified in taking the view that *N. apis* is the causative agent in most outbreaks of disease in which the Isle of Wight symptoms are present. . . .

"Experiments have conclusively proved that the spores are capable of producing a fatal disease in healthy bees, but no such experiments have been undertaken with young stages of the parasite only, and up to the present we have no evidence that the young stages are capable of causing infection when fed to healthy bees, although bees in which the young stages only are found die in large numbers. . . . It seems to the writers extremely probable that many of the stocks which recover become partially immune, at any rate for a time, to the effects of the parasite, but still continue to harbor it, and are consequently a source of danger to the noninfected stocks in the neighborhood."

Microsporidiosis in other Hymenoptera.—Infection experiments and observations, G. S. GRAHAM-SMITH (*Jour. Bd. Agr. [London]*, 19 (1912), No. 2, Sup. 8, pp. 131-132, pl. 1).—It is pointed out that while the experiments here reported indicate that wild bees and wasps may act as parasite carriers, it has not yet been shown that the *Nosema* found in naturally infected humblebees is *N. apis*.

Microsporidiosis, a protozoal disease of bees due to Nosema apis, and popularly known as Isle of Wight disease, H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par.*, 6 (1912), No. 2, pp. 145-160, fig. 1).—This paper relates to the investigations above noted.

A contribution to the knowledge of *Pseuda bombyx*, J. OHMORI (*Arch. Z. Gendtsam.*, 40 (1912), No. 1, pp. 120-122, pls. 2).—This is a report of studies of the structure and development of *N. bombyx*, the cause of petting in the silkworm, conducted in 1910-11 at the Protozoan Research Laboratory of the Royal Health Department in Berlin.

The poultry tick, D. F. LAURIE (*Jour. Dept. Agr. So. Aust.*, 15 (1912), No. 12, pp. 1251-1258; 16 (1912), Nos. 1, pp. 10-19, figs. 14; 2, pp. 111-120, figs. 17).—An account of the life history and bionomics and of preventive and remedial measures for *Argas miniatus*. In tests made to determine the efficacy of certain preparations in destroying the fowl tick, which are here reported in tabular form, kerosene oil appeared to be the most effective and cheapest.

FOODS—HUMAN NUTRITION.

The floating of oysters, J. NELSON (*New Jersey Stat. Rpt.* 1910, pp. 209-217).—The results reported seem in the author's opinion to favor the practice of "floating" oysters, which is widely prevalent in the North. Oysters are kept on submerged floats in water less salt than that of the beds during from 2 to 4 changes of tide, during which time they draw in water as when on the original beds. This process is called "floating," "giving the oysters a drink," "freshening," and "fattening." The resulting advantages are said to be removal of the mud, increased volume of the flesh of the oyster, improvement in color and texture, decrease in amount and rapidity of shrinkage, and better retention of water content in transport and storage.

In the experiments here reported, half of the sample from each bed was floated, then compared with the half not so treated. The results of 25 selected experiments are presented. Except in the case of certain ones injured in handling, oysters were found to regulate the amount and quality of the water they "breathe," opening only when the incoming tide brings water containing a certain proportion of salt, and refusing to open in fresh water. The process of floating enabled the oysters to rid themselves of the dirt brought from the beds, hence the floated product appeared cleaner. An improvement in color was also noted.

"When unfloats oysters were shucked in comparison with floated ones, and the 2 lots were left a few hours in their natural liquor, the former secreted liquor the more rapidly, and also considerable slime, in which the coarser part of the dirt became entangled. This slime became stringy, and the liquor turbid and repulsive, due to the dirt that was mixed with it.

"In strong contrast, was the clean and appetizing appearance of the floated lot; here, at first, the liquor was rather small in amount, but as much as in the former case was finally pressed out, through contraction of the tissues. It seemed that the total slime in the two cases was finally approximately equal, though at the start, the floated lot seemed to be the more slimy."

It is claimed that no deception is involved in the process, since it seems to be impossible to improve the appearance of a poor oyster by it. Water entering the tissues, as it does in the process of floating, is more firmly retained than that held by capillary attraction in the channels of the body, and much more firmly than that between the oyster and the shell. This retained water, the author believes, improves the keeping and cooking qualities. No significance is attached to the loss of flavor, as this is said to be due merely to loss of salt which can easily be replaced before serving. It appears to be impossible to have the floats near the beds, or at least it is much more convenient to have them near the store-houses. The author concludes that the practice of float-

ing is not injurious if the water in which the oysters are floated is pure, and that the practice is desirable on account of the improvement in the oyster. It is suggested that both floated and unfloated oysters be admitted to the market, since a demand for both kinds exists, and in time the demand for the floated product will be so great as to give it the greater value.

The author notes that the experiments are rather limited and that a more prolonged study of the question may be desirable.

Decay and preservation of eggs. A. Kossowicz (*Monatsh. Landw.*, 5 (1912), No. 2, pp. 48-49; *abs. in Schweiz. Wechschr. Chem. u. Pharm.*, 50 (1912), No. 28, p. 180).—Contamination of the egg by micro-organisms may occur while in the ovarian duct, but not after it is laid until age causes loss of resistance.

No organisms had entered eggs 4 weeks old; only *Cladosporium herbarum* had entered after 8 weeks, *Phytophthora infestans* after 12 weeks, and *Rhizopus nigricans* after 5 months. The germicidal power of the albumin decreases rapidly with age. In addition to his own work the author summarizes data from a large number of experiments by others.

Curing of Italian hams. J. A. SMITH ET AL. (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1912), No. 249, pp. 385-388).—Methods of curing hams in different parts of Italy are given in detail.

Mince-meat and mock mince-meat (*Pure Products*, 8 (1912), No. 10, pp. 555-557).—The results of the examination of about 500 recipes for mince-meat are given and suggestions for another standard are made.

The manufacture of gelatin. L. A. THIELE (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 6, pp. 446-451, figs. 4, dgms. 3).—This description of the manufacture of gelatin treats of cleaning the raw material, dissolving the gelatin, concentrating the solution, chilling and spreading, drying, and finishing (grinding and packing). Curves show the imports of gelatin and price fluctuations during the past 8 years.

High fat standard for ice cream. M. MORTENSEN (*N. Y. Produce Rev. and Amer. Cream.*, 34 (1912), No. 17, p. 754).—Standards and definitions are suggested favoring a high fat content (at least 12 per cent) of butter fat in ice cream.

Wheat and flour. B. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm.*, 17 (1911), pp. 73-84).—In continuation of earlier work (E. S. R., 25, p. 564), experiments with wheat and flour were carried on. A comparison of commercial flours (patent and bakers' grades), freshly ground from the crop of 1911 wheat, showed that such flour was only slightly lower in gluten and in water absorption, and in yield of bread and size of loaf was fully equal to the 1910 crop, while some superiority in the texture of the crumb was noted.

Baking tests with winter wheats grown on experimental plats and ground in a small mill showed superiority in the 1911 crop over that of 1910. "With 2 or 3 exceptions the loaf was larger and the crumb of the bread was better, both in color and in texture." The apparently better results obtained from the 1909 crop, as compared with those of 1910 and 1911, was partly due, in the author's opinion, to longer aging.

Baking tests with Ontario spring wheats grown on experimental plats showed that, in the majority of cases, the 1910 crop contained less gluten than that of 1909, while the reverse was the case with regard to absorption. "The yield of bread, consequently, is higher, but the volume of the loaf is less. Generally speaking, the quality of the bread from the 1910 crop is inferior to that of the 1909."

As regards varieties, the old Red and White Fife wheats still hold a good place, while Preston Spring, Gattineau, and Hungarian gave a rather larger volume of loaf of about equal quality.

Baking tests reported with sprouted wheat represent work by A. J. Gallbraith and submitted in a thesis. Ontario soft winter wheat and Manitoba spring wheat of medium grade were selected. Samples, allowed to germinate until the sprouts were equal to the length of the kernel, to about twice the length of the kernel, and to about 1½ inches long, were compared with ungerminated wheats. As was expected, the flours from these wheats showed considerable difference in appearance. That from the least sprouted wheat had the best color, while that from the more extended germination was very dark. On washing out the gluten it was found that the flour from the wheat with the shortest sprouts handled quite normally. The gluten from the second sample was rather soft and runny, and the third was so poor that it was impossible to make a satisfactory determination of the amount of it present.

The bread-making tests showed that the flour from wheat which was least germinated yielded bread superior in color, texture, and general appearance of the loaf to that obtained from the normal unsprouted wheat. The more extended germination allowed in the other wheats injured the quality of the gluten and apparently more in the case of the winter than of the spring wheat.

A study of the nitrogen of the sprouted and unsprouted wheats showed that "the quantity of alcohol-soluble nitrogen is apparently not influenced by the germination, but the salt-soluble compounds are slightly, and the amids very materially affected." While it was not possible to study definitely the effects of the nitrogen compounds on the bread-making quality of the flour, the results do show that while the alcohol-soluble and gliadin nitrogen remains unchanged, the amount of glutenin nitrogen decreases and the amid nitrogen increases. Apparently the destruction of the gluten is accompanied by these changes.

A study of the carbohydrates showed that, as might be expected, "the percentage of starch present in the grain decreases and the soluble carbohydrates increase. These soluble carbohydrates and the soluble protein are essential food constituents of the yeast, and possibly the better quality of bread obtained from the slightly sprouted wheat was due to the extra food materials present. On the other hand, too large an amount of the soluble carbohydrates in the flour or dough is always associated with a poor color and texture of bread, and even if the gluten was not destroyed by the longer germination, it is probable that the bread made from these samples would not have been so good as that obtained from the normal wheat. Apparently the bread-making value of the wheat is improved by germination provided this is not continued too far. When this has taken place, the dough 'works' very fast, doubtless due to the large amount of available food present, but the dough will not 'rise' properly because the gluten, or, at least, the tenacious nature of the gluten, has been destroyed."

How bread becomes stale, J. R. KATZ (*Pharm. Weekbl.*, 49 (1912), No. 27 pp. 618-631).—From various experiments it appears that bread in becoming stale loses but little water, the crumb losing from 1 to 2 per cent but the crust gaining from 8 to 9 per cent. There is a decrease in the amount of water-soluble dextrins in the crumb, the crust remaining almost unchanged.

Reheating stale bread to restore to stale bread many of the properties of fresh bread. Apparently the degree of staleness is determined by the presence of some compound which is unstable at high temperatures.

The bacterial contamination of bread, KATHARINE HOWELL (*Amer. Jour. Pub. Health*, 2 (1912), No. 3, pp. 321-324; also in *Med. Rev. of Reviews*, 10 (1912), No. 9, pp. 589, 590).—One hundred loaves of bread, wrapped and unwrapped, were collected from shops in Chicago. Dirty loaves gave an average bacterial count of 64,970 per loaf, loaves from fairly clean shops 3,117.

and from thoroughly clean shops and from the dirty shops kept wrapped bread. Wrapped bread from fairly clean shops showed a count of 848, and from the best shops 371.

Yoghourt bread. (*Food Products*, 8 (1912), No. 10, p. 560).—The substitution of milk containing the *Bacillus bulgaricus* for part of the water used in bread making is said to give a pleasant and characteristic flavor, especially in the case of rye bread.

Natural pure culture and yoghurt making. W. HENNEBERG (*Ztschr. Spiritusindus.*, 35 (1912), Nos. 30, pp. 405, 411; 31, pp. 415, 416; 32, pp. 427, 428; 33, p. 454).—Experiments are reported which have to do with the cultivation of the yoghurt bacillus by dry and wet methods.

On a new glucolytic ferment of yeast. V. BIRCKNER (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 9, pp. 1213-1229).—The ferment which occurs in California "steam beer" yeast accelerates the decomposition of glucose at high temperatures; is active at 70° F.; is not zymase; causes no gas formation; yields no alcohol; rapidly darkens glucose at 70°, giving a strongly acid reaction with gradual formation of a caramel-like deposit; is stable at room temperature in aqueous solution; is not destroyed by boiling; is active in neutral or acid solution against glucose, polyphenols, and lactates; contains no tyrosinase; does not act as a peroxidase against glucose; gives a strong pyrrol reaction; and appears to belong to the zymases although having some characteristic of the oxidases. The cleavage products are mostly acid and contain pentose and formaldehyde.

[**Macaroni**]; L. LODIAN (*Amer. Miller*, 40 (1912), No. 10, pp. 786, 787).—This is a description of macaroni made from beans, buckwheat, whole wheat, rice, wheat and rice, milk (casein), chestnuts, tree pith, and seaweed.

On the starch of glutinous rice and its hydrolysis by diastase. Y. TANAKA (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 8, pp. 578-581).—Instead of a blue coloration, the starch of glutinous rice gives a red coloration with iodine, due to the characteristic nature of the starch itself, and not to the presence of dextrans or albuminoids.

The glutinous rice starch contains none of the common starch which gives a blue coloration with iodine. The glutinous rice starch is rapidly hydrolyzed by diastase to dextrin with less production of maltose than given by potato or common rice starch. The author believes that the glutinous rice starch contains amylopectin or other analogous constituent which produces a dextrin less rapidly hydrolyzed than ordinary starch by diastase. Several other cereals were found to contain a similar starch.

Nutritive value and use of soy beans as food. H. NEUMANN (*Berlin. Klin. Wchnschr.*, 49 (1912), No. 36, pp. 1710-1714).—Conclusions favorable to the use of soy beans are drawn from the author's tests and a summary of the work of others.

The author notes that he found soy beans to increase the milk of nursing women.

Concerning the sugar content of watermelons. C. P. SHERWIN and C. B. MAY (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 8, pp. 585-588).—Analyses were made of unusually sweet watermelons with thin rinds.

They had 43 per cent juice, 47 per cent rind, and 10 per cent pulp; the ash content was about 0.25 per cent of the juice, $\frac{1}{2}$ of the ash being insoluble. Fermentation of the sugar produced a 2.5 per cent alcohol solution by weight, and from the fermented juice a 1.75 per cent acetic acid solution. The Fehling titration method showed 5.5 per cent of reducing sugar in the juice, and the polariscope a smaller quantity. About 1 per cent of the juice was sucrose.

The palm cabbages of Madagascar. H. JUMELLE and H. P. DE LA VATHIE (Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 13, pp. 587-589).—A brief description of several Madagascan varieties of palm having edible heads is given.

Cholera and tomatoes, R. RICCIARDELLI (Bol. Uhm. Form., 56 (1911), pp. 573-575; abs in Ztschr. Untersuch. Nahr. u. Genussmit., 24 (1912), No. 3, p. 250).—According to the author, the acid content of tomatoes (0.81 per cent citric acid, with traces of tartaric, malic, and oxalic acids) acts as an intestinal disinfectant.

Vegetables and typhoid fever (Brit. Food Jour., 14 (1912), No. 161, p. 83).—Quoting from the Medical Press, experiments are reported in which typhoid bacilli were found on lettuce grown in soil inoculated with the culture 31 days before gathering the plants.

Three consecutive washings in distilled water failed to remove the bacilli entirely. The dangers of using uncooked vegetables and of using human excreta as a fertilizer are emphasized.

The relatively high dextrose content in certain preserved fruits, FAYEL and GARNIER (Jour. Pharm. et Chim., 7, ser., 4 (1911), No. 6, pp. 253-255; obs. in Ztschr. Untersuch. Nahr. u. Genussmit., 24 (1912), No. 7, p. 473).—Determinations of the different sugars in dried apricots and mirabelle plum juice are reported and the results discussed with reference to the preserved fruits.

Commercial table sirups and molasses, W. FREAR (Penn. Dept. Agr. Bul. 224, 1912, pp. 97).—From an extended study, including the examination of a large number of samples of table sirups and molasses on sale in Pennsylvania, a number of general conclusions were drawn, from which the following are quoted:

"The goods sold as 'maple sirup' are, with few exceptions, true to name. . . . The sirups labeled 'maple and cane' or 'cane and maple', usually contain only small proportions of the maple product. There is little sugar cane sirup on the market.

"The molasses on sale is practically confined to the products of the modern sugar-house. The 'New Orleans molasses' of to-day differs materially in flavor, sugar richness, and probably also in acidity from the older 'open kettle' product formerly sold under that name. The ash limits for table molasses are exceeded in but few cases, but the organic solids not sugar are, in some cases, so high as to suggest that the molasses in these cases is of very inferior grade. The quantities of sulphur dioxide are usually not high. The presence of tin and zinc in small quantities is common, and, in the latter case, suggests the need for greater care in cleansing before filling the tins in which these goods are usually retailed.

"The samples of refined molasses submitted were too few to permit any judgment of their average quality as compared with that of the ordinary molasses.

"The 'table sirup with cane flavor' and 'compound molasses' formed a large fraction of the 'table sirups' on sale. The goods of the former class frequently lack cane flavor, in the literal sense of the term. The proportions of glucose claimed on the labels are rarely exceeded in the goods. As a class, these goods contain more water than should be introduced in the ingredients named. The proportions of sulphur dioxide present are, as a rule, very low, indicating that the glucose now used for these mixtures is practically free from this constituent, which was formerly found in larger amounts.

"Sulphur dioxide appeared, in a few cases, in classes of sirups not covered by the proviso of the food law that tolerates it, within certain limits and under certain conditions, in molasses.

"In case was saccharin, benzoic acid, or salicylic acid found present. The labeling of many of . . . [the] samples [examined] was open to objection."

The rôle of caffeine in the cardiac action of coffee, H. BUSQUET and M. TIRZARAU (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 5, pp. 362-365).—From experiments with isolated rabbit heart and with a dog the authors conclude that caffeine is apparently the principal agent in the cardiac action of coffee.

Coffee substitute, L. FARCY (*Ann. Falsif.*, 5 (1912), No. 45, pp. 361, 362, figs. 4).—A Swiss coffee substitute was found by chemical and microscopical examination to contain about 50 per cent of caramel, 25 per cent of chicory, from 10 to 12 per cent of parched barley, and about the same amount of coffee. "Ochseena", a so-called vegetable meat extract, C. REESE and J. DROST (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 24 (1912), No. 3, pp. 240-244).—Analytical data are reported and discussed.

Regulation regarding tinning of culinary utensils, A. GAUTIER (2. *Cong. Internat. Hyg. Aliment. Bruxelles [Proc.]*, 1 (1910), Sect. 3, pp. 57-62; *Bul. Soc. Sci. Hyg. Aliment.*, 1 (1911), No. 1-2, pp. 189-193).—Laws prescribing the permissible proportion of lead in tin plate of culinary utensils in France, Germany, Belgium, and other countries are cited. England has no such laws.

The permissible amount is deemed from $\frac{1}{2}$ to 1 per cent of lead. Five per cent has been found to be injurious, and in tinning of soldered utensils the tinning bath may gradually acquire as much as this from the solder. The author believes that the French regulation, permitting the use of tinning baths containing $\frac{1}{2}$ per cent of lead, is reasonable.

Rules and regulations for carrying out the provisions of the food and drug law of Connecticut—revision of January 1, 1912 (*Hartford*, 1911, pp. 46).—Detailed instructions for carrying out each of the regulations are given.

Laws of Wyoming providing for pure food, drugs, drink, and illuminating oils (*Cheyenne, Wyo.*, 1911, pp. 16).—The laws of Wyoming relating to the manufacture and sale of foods, drugs, beverages, and illuminating oils are given.

Eighteenth annual report of the dairy and food commissioner of the State of Michigan for the year ending June 30, 1911, G. M. DAME (*Ann. Rpt. Dairy and Food Comm. Mich.*, 18 (1911), pp. 192).—This volume contains new legislation relating to the sale of adulterated candies, advice on the care of milk in hot weather, reports of food, dairy, drug, and apiary inspections, the state analyst's report of analyses of miscellaneous foodstuffs and feeds, and other similar data.

Preliminary report of the dairy and food commissioner for the year 1911, FOURT (*Penn. Dept. Agr. Bul.* 221, 1912, pp. 45).—This report contains expositions of the State pure food laws passed in 1911, relating to sausage, milk, and cream. Brief summaries of inspections of various foodstuffs are also given.

Feeding children for efficiency, W. S. CORNELL (*Forecast*, 4 (1912), No. 4, p. 125-128, figs. 2).—Arguments for the school lunch are presented, with sample menus of meals that can be served for 3 cts.

Tests with 362 children are referred to which indicate that those who received school lunches gained considerably more in physical measurements (weight, height, hand strength, and lung capacity) during 6 months, than those who did not receive the lunches. Tests with 40 other children for 3 months showed that the fed children gained slightly more than the unfed in lesson and conduct averages.

Some fundamental principles in studying infant metabolism, F. G. BENEVOISE and F. B. TALBOT (*Amer. Jour. Diseases Children*, 4 (1912), No. 3, pp. 129-

136, *Age*. 4).—Work of previous experimenters is criticized on the ground that sufficient account has not been taken of muscular activity.

In the experiments here described graphic records of muscular activity were made. The periods of observation were short and as far as possible while the infants were asleep. The energy measurements were made indirectly by measuring the gaseous exchange.

A close relation was found between carbon dioxide production, pulse rate, and muscular movements. The pulse rate in the younger infants was much less stable than in the older infants, the slightest motion causing marked increase of the rate. A description and a diagram of the apparatus used are given.

A consideration of some chemical transformations of proteins and their possible bearing on problems in pathology, F. P. UNDERHILL (*Arch. Int. Med.*, 8 (1911), No. 3, pp. 356-381).—Chemical changes in proteins during the process of digestion are considered, together with their possible relation to pathological conditions.

The sparing value of fats, A. BARTMANN (*Ztschr. Biol.*, 58 (1912), No. 8-11, pp. 375-419, *figs.* 5).—Experiments in which dogs were fed lard and later raw fat pork showed that the sparing value of fat was constant, being about 7 per cent.

An efficiency curve of the fat was obtained by plotting the sparing value against the amount fed. This curve reaches its maximum at about 150 per cent of the necessary energy supply. Feeding large amounts of fat caused increased elimination of nitrogen through the alimentary tract.

Water balance in rest and in mountain climbing, G. GALEOTTI and E. SIGNORELLI (*Biochem. Ztschr.*, 41 (1912), No. 3-4, pp. 268-286).—Water excretion through the kidneys, lungs, and skin was not affected by altitude alone, but in mountain climbing as much as 4.2 liters passed through the skin in a day. The weight so lost was quickly regained.

The physiological significance of the segmented structure of the striated muscle fiber, R. L. LILLIE (*Science*, n. ser., 36 (1912), No. 921, pp. 247-255).—In this paper two views of the cause of muscular contraction are contrasted, namely, that the process is analogous to the absorption of water by a sheet of acidulated gelatin, and that the process results from transformation of surface energy of the ultimate structural elements or colloidal particles (submicrons) composing the fibrils.

A comparative study of temperature fluctuations in different parts of the human body, F. G. BENEDICT and E. P. SLACK (*Carnegie Inst. Washington Pub.* 155, 1911, pp. 73, *figs.* 38).—The purpose of these investigations was to determine the best place for accurate and constant measurement of body temperature, the temperature gradient of the body, and whether or not the temperature fluctuations are uniform in different parts of the body. The thermal junction apparatus used is described in detail.

The conclusion is reached that, aside from the skin temperature, the temperature of the rectum or of the vagina is the best index of body temperature.

A bicycle ergometer with an electric brake, F. G. BENEDICT and W. G. CAMP (*Carnegie Inst. Washington Pub.* 167, 1912, pp. 44, *figs.* 16).—An apparatus designed to measure the amount of mechanical work done by a man, and essentially the same as that in use at this Department (*El. S. R.*, 21, p. 63), is described. It consists of a bicycle the rear wheel of which is a copper disc rotating between the poles of an electro-magnet. The calibration of the instrument is described and a study reported of the magnetic reactions in the disc.

ANIMAL PRODUCTION.

The principles of Mendelian inheritance and their cytological foundation, F. PÉCHOURAZ (*Rev. Gén. Sci.*, 23 (1912), No. 16, pp. 613-623, figs. 3).—This is a review and critical discussion of Mendelism, with special reference to the function of the chromosomes.

Gametic coupling as a cause of correlations, G. N. COLLINS (*Amer. Nat.*, 46 (1912), No. 550, pp. 569-590).—It is pointed out that the theory that the various degrees of association in gametic coupling fall into a regular series, represented by powers of two, has been accepted without adequate analysis of data. To overcome the lack of a standard for making comparisons the author advocates the use of Yule's coefficient of association.*

From studies of maize and other hybrids the author finds that in several cases correlations are reversible; depending on the way the characters were combined in the parents. This fact makes it necessary to assume that characters which at one time attract each other, at other times exhibit repulsion.

The general conclusion reached is that associations between characters, like the appearance of single characters, may arise at different stages in the ontogeny of the individual.

Another view of sex-limited inheritance, R. M. STRONG (*Science*, n. ser., 36 (1912), No. 927, pp. 443-445).—In the first generation of crosses with white ring doves (*Turtur alba*) and blond ring doves (*T. risorius*) the hybrids resembled one parent or the other in equal numbers. The blond hybrids were mostly males and the white hybrids were all females. When these latter were crossed back on white males only white offspring were obtained, and are therefore so-called extracted recessives. An explanation is given to account for these results without assuming that the male is homozygous for sex and the female heterozygous, or that a spurious allelomorphism may exist with the consequence that certain sex and somatic factors may not be present in the same gamete.

Another sex-limited character, E. N. WENTWORTH (*Science*, n. ser., 35 (1912), No. 913, p. 986).—The rudimentary mammae located on the scrotum of the male and on the inside of the thigh of the female swine appear to be a case of sex-limited inheritance in a manner similar to the inheritance of the horns in Wood's crosses in sheep (*E. S. R.*, 22, p. 378).

The genetic factors in the development of the house mouse which influence the coat color, A. L. HAGEDOORN (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 6 (1912), No. 3, pp. 97-136, pl. 1).—A detailed study of the inheritance of coat color in over 6,000 animals.

The sex ratio in hybrid rats, HELEN D. KING (*Biol. Bul. Mar. Biol. Lab. Woods Hole*, 21 (1911), No. 2, pp. 104-112).—This reports data of experiments with hybrid rats in which the excess of males was so far beyond the limits of normal variation that it appears that hybridizing altered the sex ratio to an appreciable extent. This is in agreement with the results obtained by other observers.

Studies in the experimental analysis of sex.—IX, On spermatogenesis and the formation of giant spermatozoa in hybrid pigeons, G. SMITH (*Quart. Jour. Micros. Sci.*, n. ser., 58 (1912), No. 229, pp. 159-170, pl. 1).—These are bodies of normal male pigeons and doves and 3 male hybrids produced by the mating of a male pigeon with a female domestic dove. As a rule the findings of Guyer[†] were confirmed. The following conclusions were drawn:

—The ripe spermatozoa of the hybrids, which were present in large quantities, besides showing in certain cases structural abnormalities, were on the average twice as large as the normal spermatozoa of either parental type.

* Phil. Trans. Roy. Soc. London, Ser. A, 194 (1900), pp. 257-319.

† Diss., Univ. Chicago, 1909; *Biol. Bul.*, 16 (1909), p. 193; *Anat. Anz.*, 34 (1909), p. 502, 573.

"The first maturation or reduction division in the hybrids is abnormal in that the chromosomes do not enter into the normal synapses to produce bivalent or bivalent chromosomes, but they are scattered as irregular chromatin masses of unequal size on the mitotic spindle, and are irregularly distributed to the opposite poles of the spindle.

"The second maturation division in the hybrids is almost entirely suppressed, the secondary spermatocytes proceeding without further division to form spermatids and spermatozoa of twice the normal size. Many of these spermatozoa are structurally normal, apart from their double size, while others are abnormally twisted or beaded. All the spermatozoa were probably impotent, since these hybrids and all others of a similar kind are invariably sterile.

"The explanation of the sterility of such hybrids is found, in accordance with Guyer's idea, to reside in the disturbance of the synaptic division during maturation, this disturbance being due to the incapability of the chromosomes derived from the specifically different parents to fuse to form the normal synapses."

The male generative cycle in the hedgehog; with experiments on the functional correlation between the essential and accessory sexual organs. F. H. A. MARSHALL (*Jour. Physiol.*, 43 (1912), No. 3-4, pp. 246-259).—Recent studies of the sex glands of the hedgehog, combined with previous investigations of other animals, led the author to the following conclusions:

"The males of most, if not all, wild mammals experience a definite sexual cycle, the testes and accessory generative organs passing through alternate periods of rest and activity, but in the domesticated varieties and in man the period of rest is liable to be much reduced or may be absent altogether. . . . The vesiculæ seminales are secretory glands, and do not contain spermatozoa either in the breeding or in the nonbreeding season. Complete castration during the period of rest prevents the seasonal development of the vesiculæ seminales and other accessory male organs, or, if such development has already begun, arrests its further progress. Unilateral castration, however, does not inhibit the growth of the accessory organs and has no effect on the symmetrical arrangement of these organs. Vasectomy, either unilateral or double, does not inhibit the growth of the vesiculæ seminales or other accessory organs, but unilateral vasectomy may prevent the full development of the testis on the side of the operation, as compared in size with the testis on the unoperated side. The periodic development of the accessory organs is not due to stimuli set up by sperm ejaculation, but is probably the result of an internal testicular secretion elaborated in the interstitial tissue during the season of generative activity."

The maturation divisions of the mammalian ovum, M. ATHIAS (*Arch. R. Inst. Bact. Camara Pestana*, 3 (1912), No. 3, pp. 287-370, pls. 4).—A study on the segmentation of the ovum in the cat, rat, mouse, and other small mammals. A bibliography is appended.

Development of new feathers, FRIEDA BOENSTEIN (*Arch. Naturgesch.*, (1911), 1, Sup. 4, pp. 1-11, pls. 2; abs. in *Jour. Roy. Microsc. Soc.* (London), 1912, No. 3, p. 299).—This is a study of the histology of the feather in ducks, pigeons, and other birds.

"A new germ is always formed for a new feather; the new germ arises while the old feather is still growing; it is formed from the malpighian layer, on the side of the base of the feather follicle. The new feather germ forms a papilla which grows into the deeper layers of the cutis, and from this process the papilla is formed. The old papilla atrophies after the old feather falls. A study of the foot of the capercaillie, where feathers and scales occur in

conclusion that a feather corresponds not to an entire part of a scale, the rest being suppressed."

(A summary is appended.)

Evolution of birds. E. RETTERER and A. LELIÈVE (*Compt. Rend. Soc. Sci. Paris*, 1911, No. 35, pp. 596-599; abs. in *Jour. Roy. Micros. Soc.*, 1911, No. 3, p. 303).—The so-called "ossified" tendons in birds were found to be due to hypertrophied tendinous tissue, the cells becoming vesicular and the tissue calcified. Around the vascular canals there is a delicate zone of vesicular cells, which take on the characters of true bony tissue.

The psychological basis of domestication. P. HACHET-SOUPLET (*Rev. Sci. Paris*, 50 (1912), II, No. 10, pp. 294-299).—A study of the domestication of wild animals and birds from the psychological standpoint. The author advocates the establishment of a central institution for domesticating game birds for the purpose of replenishing the farms, fields, and forests of France with new species.

Stock breeding in the Catanduanes Islands. E. H. KOEET (*Philippine Agr. Rev. [English Ed.]*, 5 (1912), No. 6, pp. 305-308, pl. 1).—This contains brief notes on the carabao, Catanduanes pony, goats, swine, and native cattle of the Catanduanes Islands.

Cattle business in Paraguay. C. FERRIS, JR. (*Daily Cons. and Trade Rpts. [U. S.]*, 15 (1912), No. 181, pp. 586, 587).—This contains information on general conditions of cattle raising in Paraguay.

Origin and descent of the Norwegian breeds of cattle. J. FROST (*Amer. Breeders Mag.*, 3 (1912), No. 3, pp. 216-221).—A translation of an article previously noted (*E. S. R.*, 27, p. 277).

Transmission of color and color markings in Hereford-Shorthorn crosses. P. E. FOOTE (*Amer. Breeders Mag.*, 3 (1912), No. 3, pp. 201-204).—A progress report by a committee on animal hybrids of the American Breeders' Association.

Among the facts regarding the transmission of color and color markings which are regarded as well founded are the following: "The circle around the eyes would seem to go with the solid red color, as the greater number of red calves carry the characteristic eye circle. The fact that out of 16 roan calves 15 have no red markings on face (having only imperfect eye circles) strongly points to the dissociation of eye circles with roan color. The cross of red and white results in roan, and the roan cow, having received red from one parent and white from the other, transmits the red to about half her offspring and roan to the other half, so that about half the calves from a roan cow bred to a Hereford bull will be red and the other half roan."

British breeds of sheep. R. WALLACE (*Pastoralists' Rev.*, 21 (1911), Nos. 8, pp. 344, 345; 9, pp. 952-954; 21 (1912), Nos. 11, pp. 1160, 1161, figs. 8; 12, pp. 1320, 1321, figs. 2).—An account of the origin and characteristics of the following breeds of sheep: Cheviot, English Leicester, Border Leicester, Wensleydale Longwool, Lincoln, Kent or Romney Marsh, Devon Longwool, South Devon, Dorset, Roscommon Longwool, Dorset Horn, and Ryeland.

Concerning the fat-tail and the broad-tail sheep. C. C. YOUNG (*Amer. Breeders Mag.*, 3 (1912), No. 3, pp. 181-200, figs. 9).—This describes the characteristics of the breeds of sheep which have originated from the 2 species *Ovis montanus* (fat-tail), and *O. platyura* (broad-tail). See also a previous note (*E. S. R.*, 26, p. 675).

Monograph on the vicuña. C. G. MADUEÑO (*Trab. 4. Cong. Cient. Santiago de Chile*, 2 (1912), pp. 5-30, pls. 2, figs. 5).—This contains an account of the

history, characteristics, and value for agriculture of the vicuña, which has previously, in the opinion of the author, been underestimated.

Experiments in swine feeding, G. E. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 37 (1911), p. 150).—A brief report of progress in swine feeding tests.

Skim milk at 20 cts. per hundredweight proved a cheaper source of protein than oil cake at \$36 per ton, but in the absence of skim milk the latter may constitute 10 per cent of the total meal ration. The use of low-grade flours for pig feeding was unprofitable. The amount of water supplied to pigs is thought to be an important factor in growth. The best results were obtained by mixing the meal with enough water to make a thick slop.

Horses and practical horse keeping, F. T. BARTON (*London* [1912], pp. 643, pls. 47, figs. 23).—A practical handbook on the horse dealing with breeding, breaking, management, lameness, diseases, etc.

The horse and its relatives, R. LYDEKKER (*London*, 1912, pp. XII+236, pls. 24, figs. 11).—An account of the natural history of the horse, mule, ass, kiang, and zebra, and their extinct forerunners. The work was written for breeders, racing men, antiquarians, naturalists, and big-game hunters.

Horse breeding (*London: Board of Agriculture and Fisheries*, 1912, pp. 69).—This is the preliminary report of the Animals Division as to the administration of the grant under the Development Act for the encouragement and improvement of the light horse breeding industry.

A history of the Arabian horse and its influence on modern breeds, F. KNORR (*Amer. Breeders Mag.*, 3 (1912), No. 3, pp. 174-180, figs. 3).—A brief historical survey.

The evolution of a type of horse, W. S. ANDERSON (*Amer. Breeders Mag.*, 3 (1912), No. 3, pp. 209-216, figs. 2).—A discussion of how a type of saddle horse has been developed by the elimination of undesirable unit characters. The following working hypothesis is suggested:

"The unit characters of the horse may, in a tentative way, be stated to be as follows: That the finer qualities are recessive to the coarse ones; as the thin, pointed ear is recessive to the heavy thick one; the clean, small head recessive to its opposite; the short neck recessive to the long one; the flat foot recessive to the 'mule' foot; the calf knee dominant to the straight, perfect knee; strength dominant to weakness; true action and superior action recessive to untrue and inferior action. In color, chestnut is recessive to gray, bay, and black."

Mendelian experiments with Thoroughbred horses, C. C. HURST (*Bloodstock Breeders' Rev.*, 1 (1912), No. 2, pp. 86-90).—An outline of an experiment recently undertaken to produce from Thoroughbreds a race of steeplechasers which will breed true.

The other side of the question (*Bloodstock Breeders' Rev.*, 1 (1912), No. 2, pp. 90-92).—A criticism of the above, mainly on the ground that there is no such thing as a Mendelian factor for jumping.

The figure fallacy (*Bloodstock Breeders' Rev.*, 1 (1912), No. 1, pp. 37-40).—The weak points in breeding horses by the Bruce-Lowe figure system are pointed out.

Tests of ~~grass~~ hay for work horses, H. J. WATERS (*Breeder's Gaz.*, 61 (1912), No. 13, pp. 763, 764, fig. 1).—These tests were made with artillery horses at the Fort Riley military reservation. There were 10 lots with about 75 in each lot, and 7 lots containing from 17 to 20 horses each. Most of the experiments lasted from 110 to 140 days each.

The cheapest ration, and the one which gave the largest gains, consisted of 8 lbs. of corn, 2 lbs. of oats, and 10 lbs. of alfalfa hay, and cost 18 cts. per

head per day. The gain made was 25.6 lbs. per horse in 140 days. A ration consisting of oats, corn, wheat bran, and timothy hay in the ratio of 4:6:4:12 produced 6 lbs. of gain in 120 days, and the animals showed the best condition of any in the test, but the ration cost 19 cts. per day. When oil meal was used to replace a portion of more expensive grain at the rate of about 1 lb. per day the horses showed excellent condition and there was no evidence of softness. This cheapened the ration about 2 cts. per day over the ration previously used.

[Report of] the professor of poultry husbandry, W. R. GRAHAM (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 37 (1911), pp. 159-167*).—During the year 23 bred-to-lay Barred Plymouth Rock pullets laid 3,514 eggs, as compared with 2,482 laid by exhibition pullets. The latter ate more feed but were larger birds. Data on economic egg production of 341 fowls for 11 months are summarized in the following table:

Egg record of hens and pullets from October 1, 1910, to September 1, 1911.

Breed.	Males.	Females.	Eggs laid.	Cost.	Average eggs per hen.	Grain consumed.	Milk consumed.
Yearling Barred Rocks.....	2	55	5,961	\$73.04	108.38	Lbs. 4,357.0	Lbs. 4,787.0
Barred Rock pullets.....	4	32	11,928	121.32	129.65	2,042.5	9,195.0
Buff Orpington pullets.....	5	80	6,401	69.45	106.68	4,805.0	4,597.0
White Leghorn pullets.....	6	111	13,504	116.32	121.65	6,739.0	8,704.0
Minorca hens and pullets.....	2	23	1,726	31.76	75.94	1,874.0	2,117.5
	19	341	39,520	411.89	115.83	24,817.5	29,400.5

The following table summarizes the effects of different animal feeds in a mixed ration upon egg production. Each lot consisted of 25 females and 2 males.

Feeding tests with Buff Orpingtons from October 1, 1909, to April 30, 1910, and with Rhode Island Reds from October 1, 1910, to May 31, 1911.

Kind of animal feed.	Buff Orpingtons.					Rhode Island Reds.				
	Animal feed.	Cost of total ration.	Eggs laid.	Cost per dozen eggs.	Percentage of eggs hatched.	Animal feed.	Cost of total ration.	Eggs laid.	Cost per dozen eggs.	Percentage of eggs hatched.
Buttermilk.....	Lbs. 1,453.00	\$18.16	2,040	10.68	55.00	Lbs. 1,760.50	\$25.60	1,702	17.43	57.00
10 per cent dry mash beef scrap.	34.00	19.85	1,670	14.28	50.50	61.50	23.06	1,320	20.96	56.40
Beef scrap in hopper.	141.00	22.21	1,664	15.84	33.00	106.00	23.92	1,625	17.66	51.60
Green cut bone....	127.75	21.37	1,654	15.48	40.50	182.50	22.44	1,359	19.81	64.50
No animal food....		17.99	1,496	15.48	59.50		17.70	730	29.09	66.25

The average cost of feed for 100 hens kept in an open house was 16.5 cts. per dozen. In a feeding test which involved 583 chickens, kept in colony houses on a ration of mixed grain and buttermilk, 3.3 lbs. of grain was required to produce 1 lb. of growth.

Essentials in profitable egg production, H. R. LEWIS (*New Jersey Stat. Bul. 244, pp. 5-36, pls. 10*).—A bulletin on practical poultry keeping, in which the chief factors concerned in the profitable production of eggs are discussed, and directions given for the hatching, brooding, and feeding of poultry, the marketing of eggs, and poultry house and appliance construction.

Increasing the egg supply on the farm, J. B. MORMAN (*Farm and Fireside, 55 (1912), No. 26, p. 4*).—The author gives the egg records of his flock of about

50 laying White Plymouth Rock hens for the 5 years 1907 to 1911, inclusive. By means of charts he indicates how, by the selection and breeding of early and good layers, he has increased the egg production of his flock from 3,968 eggs in 1907 to 5,573 eggs in 1911.

Increasing the winter yield of eggs. W. T. WITTMAN (*Penn. Dept. Agr. Bul.* 219, 1912, pp. 91, pls. 20).—This treats in a popular and practical way of the subjects of poultry breeding, management, incubation and brooding, feeds and feeding, houses and yards, and table eggs and egg yield.

The growth of ducks on four different kinds of feed. A. MAGNAN (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), Nos. 23, pp. 1535-1538; 25, pp. 1714-1717; 155 (1912), No. 2, pp. 182-184).—Rouen ducks made a less rapid growth on a vegetable diet than on a diet of either flesh, fish, or insects. The greatest final weights were obtained on the flesh diet. Growth seemed to be arrested more quickly on the fish and insect than on the vegetable diet. Those fed vegetables laid fewer eggs, but the color of the yolk was of a deeper yellow than the eggs of the other lots. The liver and kidneys of the slaughtered lots were larger than where the feed consisted of fish and insects.

The turkey as an egg producer. W. N. IRWIN (*Amer. Breeders Mag.*, 3 (1912), No. 3, pp. 204-208, figs. 4).—Attention is called to the value of the turkey as an economical producer of eggs, a feature of the poultry industry which has previously been overlooked.

Partridges and partridge manors. A. MAXWELL (*London, 1911*, pp. XII+327, pls. 16, figs. 8).—A popular work in which the partridge is treated as a valuable by-product of the English farm.

Fur farming for profit (*New York, 1912*, pp. 188, figs. 50).—"A practical text-book on breeding fur-bearing animals, either as a distinct industry or in connection with specialized or general farming."

Oyster culture studies in 1910. J. NELSON (*New Jersey Stat. Rpt.* 1910, pp. 185-218, pls. 2).—The spatting observations were continued in 1910 as in previous years, but the season was unusual in several respects. The fry in the water appeared and disappeared in a more erratic way than usual. There was a large amount of spawn in the oysters, but it was given out grudgingly though at frequent intervals, and the fry so prepared seemed to disappear without setting. Spatting did not take place before June 28 nor after July 7, and the climax occurred in the middle of the first week in July. At that time there was not a large amount of fry in the water. The nearer the shells were planted to the day of the spatting climax, the better the catch. Shells planted June 20 bore an average of 3 spat per shell, those planted June 26, 13, those planted July 1, 14, while those planted on the day of the climax bore more than twice as many. Therefore, even a few days' sojourn of the shells in water was sufficient to deteriorate the spat-catching qualities of the cultch.

The floating laboratory used in this work is illustrated and described. Experiments made in floating oysters are noted on page 762.

Concentrated feeding stuffs. C. S. CATHCART ET AL. (*New Jersey Stat. Bul.* 243, pp. 3-62).—This contains the results of feeding stuffs inspection in accordance with the state law and other data. Analyses are reported of cottonseed meal, cottonseed feed, linseed meal, ground flaxseed, flaxseed screenings, gluten feed, hominy meal, distillers' dried grains, meat meal, beef scraps, blood meal, malt sprouts, rye bran, rye middlings, ground rye, ground oats, crushed oats, oat hulls, brewers' dried grains, molasses feed, ground wheat, shredded wheat, wheat bran, wheat middlings, barley blowings, alfalfa meal, dried beet pulp, red dog flour, puffed rice screenings, corn meal, corn-and-cob meal, cob meal, buckwheat middlings, buckwheat bran, buckwheat offal, and proprietary mixed feeds.

Cattle feeds. R. HAROUBET (*Ann. Ept. Ontario Agr. Col. and Expt. Farm*, 37 (1911), pp. 63-76).—Analyses are reported of soy beans, cotton-seed meal, dried brewers' grains, shorts, middlings, a proprietary hog feed, linseed cake, pea meal, apple pomace, and silage.

The coming of dried beet pulp. D. J. WHITNEY (*Pacific Rural Press*, 84 (1912), No. 3, pp. 49, 62, 63).—Attention is called to the value of beet pulp as a feed for live stock, and particularly the dried pulp which is being produced in increasing quantity in this country.

Potato greens as stock food. W. DAWSON, Jr. (*Daily Cons. and Trade Rpts. [U. S.]*, 15 (1912), No. 218, p. 1392).—According to a German authority, the consul general reports, potato tops are not harmful to animals as is commonly supposed. It is believed that the apparatus used for drying beets, potatoes, and other products can be used for drying the potato tops.

Hides and skins (*Chicago, 1912*, pp. 15+247, pls. 11, figs. 14).—This book gives instructions for handling hides of the larger domesticated animals, from the animal's back to the tannery door. It was written mainly for farmers and local butchers. It is stated that hides from Chicago packers bring higher prices than those of the same grade of animals from sources where the hide is not properly handled.

Regulations for animals on the German railways (*Zentbl. Preuss. Landw. Kammern*, 2 (1912), No. 16, p. 111; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intell. and Plant Diseases*, 3 (1912), No. 6, p. 1364).—These regulations relate to the care and feeding of animals during transportation on German railways, which were to take effect May 1, 1912.

DAIRY FARMING—DAIRYING.

A study of the metabolism and physiological effects of certain phosphorus compounds with milch cows, II. A. R. ROSE (*New York State Sta. Tech. Bul.*, 20, pp. 3-32, figs. 4).—The work reported in this bulletin was made in order to check the results of work previously noted (*E. S. R.*, 18, p. 568), repeating the work in such a way as to eliminate more of the variable factors. This was effected by adjusting one of the animals used in the previous experiment to a low phosphorus ration, very nearly identical to the one formerly employed, and adding thereto the calcium salt of phytin. The technic of the work differed in no essential way from the previous experiment.

The results are summarized as follows:

"In this, as in the former experiments, the organic phosphorus ingested was eliminated very largely in the form of inorganic phosphorus by way of the intestine, the amounts of phosphorus in the urine being very small. When phytin was withdrawn from the ration, the decrease of phosphorus in the urine was immediate; when phytin was added, a rise in phosphorus occurred after a lag of 2 days. Phytin caused more phosphorus to be eliminated through the kidney than did whole wheat bran. The long duration of the low-phosphorus period did not in itself affect the phosphorus content of the urine nor the phosphorus balance.

"The insoluble phosphorus of the feces diminished with decreasing amounts of insoluble phosphorus in the rations, when the latter ranged above 14 gms.

"The soluble organic phosphorus disappeared very largely from the alimentary tract. The apparent utilization was poorer in the low-phosphorus periods and in the calcium phytate period than in the whole-bran period.

"For maintenance of phosphorus equilibrium in this species of animal the requirement would seem to be the amount of phosphorus eliminated in the milk plus 26 mg. per kilogram of body weight; an excess over this amount causes

phosphorus retention, and smaller quantities result in loss of phosphorus from the organism.

"The addition of calcium phytate increased the potassium both in the urine and dung, and changed the path of elimination of part of the magnesium from the kidney to the intestine. The calcium added as calcium phytate was almost entirely eliminated by the intestine immediately after administration. The calcium of the urine increased with decreasing phosphorus in the rations and decreased when calcium phytate was added.

"The nitrogen compounds of the ration were well utilized and for the most part a positive nitrogen balance was maintained. The animal gained 19 kg. during the experiment, half of which could be accounted for by the plus balance of nitrogen. There was a suggestion of a parallelism between the nitrogen and phosphorus balances.

"The former observations as to the influence of phosphorus compounds on the oestrum and the amount of urine voided were not corroborated; neither was the laxative effect previously noted. The difference in the moisture content of the feces of the several periods of this experiment was very small.

"A long low-phosphorus period resulted in unfavorable symptoms. The animal returned to a normal condition after a week's feeding on ash-rich rations including alfalfa, silage and wheat bran.

"The volume of the milk fluctuated inversely with the amount of phytin phosphorus in the rations. The increase of milk flow on removal of phytin was not a mere dilution. Except for the change in the amount of fat, the composition of the milk was not materially altered. The responses of the fat to the fluctuations of phytin phosphorus were immediate and consistent, as distinct, though not quite as large, as in the previous experiments. The best milk flow, both as to amount and fat content, happened to occur in the period of phosphorus equilibrium."

[Report of] the professor of animal husbandry, G. E. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 37 (1911), pp. 141-149).—The records of the dairy herd are given and several feeding tests are reported.

When dried brewers' grains were substituted for bran the milk production was increased in 9 out of 11 cows. Cotton-seed meal appeared to be equal to twice its weight of bran. Soy-bean meal gave results almost identical with those from cotton-seed meal. The normal milk yield was retained when a good quality of alfalfa hay replaced the grain ration.

The dairy herd, F. C. MINKLER (*New Jersey Stat. Rpt.* 1910, pp. 53-57, pls. 7).—This gives the individual milk records, and an account of the methods of feeding the college herd. Thirty-one cows gave an average annual yield of 8,661 lbs. of milk with a fat content of 3.96 per cent. The following table gives some of the results obtained with the cows of different breeds kept in the college herd:

Comparison of the milk yields and income from dairy cows.

Breed.	Number of cows.	Average yield of milk.	Average fat test.	Average yield of milk fat.	Average yield of milk per day (for entire year).	Average number of days in milk.	Value of milk at 6 cts. per quart.
		Lbs.	Per cent.	Lbs.	Lbs.		
Holstein.....	16	9,724.2	3.43	333.91	26.6	284	\$71.89
Jersey.....	7	7,979.0	5.17	411.84	21.9	288	228.38
Guernsey.....	4	5,822.0	4.88	282.42	15.9	212	132.73
Ayrshire.....	4	8,680.8	3.72	34.43	23.6	270	241.30

[Report of] the professor of dairy husbandry, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Hopt. Farm, 37 (1911), pp. 89-140*).—The value of boric acid, borax, and sodium benzoate were tested as preservatives for Camembert and cream cheese, but they were found unsatisfactory, even aside from the question of healthfulness.

Studies of the effect of keeping soft cheeses at different temperatures gave the following results: "The Camembert cheese kept in the house refrigerator were unsaleable in about a week or 10 days, while the cream cheese remained good for 10 to 12 days under similar conditions. In the ice-cold storage all the cheese kept in first-class condition for about 2 weeks, but they tended to become moldy and go off in flavor after 2 weeks. Where the cheese were placed in mechanical storage at a temperature of 3° below freezing point, the cheese kept well for 3 weeks and were in fairly good condition at the end of nearly a month. Those cheese kept at ordinary room temperature began to go off in flavor and become moldy in about 5 days."

An unsuccessful attempt was made to ripen Camembert cheese, but a Pont L'Eveque cheese was ripened with good results.

In coloring cheese the best results were obtained by using 20 cc. of cheese annatto coloring per 100 lbs. of cream for cream cheese, and 10 cc. per 100 lbs. of mixed milk and cream for the Gervais cheese. Analyses of Gervais, Camembert, and cream cheese are reported.

In experimental work in making Devonshire cream a product of good quality was produced, either by separating the milk with a cream separator at temperature of from 170 to 180° F., or by separating at about 100° and afterwards heating the cream at a higher temperature. It may then be bottled while hot, covered, and set in a refrigerator to cool. Such cream should test from 50 to 60 per cent fat, and should keep in good condition for a week or 10 days. There was found to be less loss of fat than in the ordinary method of setting.

A number of tests were made to compare single-service paper bottles with glass bottles. The milk was pasteurized, then cooled to about 58°, and placed in the various packages and allowed to stand in a room where the temperature averaged 56° F. There was very little difference in the milk in the various containers as to temperature or acidity, but some of the paper packages imparted a package flavor to the milk after standing in them for about 24 hours. One or 2 of the monoservice paper bottles compared favorably with milk in the glass bottles. "If these packages can be put on the market in Canada at a reasonable price, we see no reason why they may not displace the ordinary glass bottle as a container for retail milk and cream."

As a result of experiments in weighing vs. measuring cream samples for Babcock test, the use of a sensitive balance is advised, but where none of the cream tests over 25 to 30 per cent no serious error should result by using an 18 cc. pipette, if care be taken to rinse all the cream from the pipette into the test bottle. No appreciable difference was found in the reading of 3 types of cream scales. In comparing the weights of cream and percentage of fat, no difference was found between the first and the twelfth bottle on the 12-bottle scale.

Numerous tests were made in sampling and testing cream. A sample of cream kept one month in tightly stoppered bottles averaged practically the same percentage of fat whether kept at low temperature or moderately warm temperature. There did not seem to be any advantage in the aliquot method over the uniform sampling for composite testing of cream. After testing numerous preservatives, it was found that the one used at the station for a number of years was as good as any, namely, 3 parts of bichromate of potash and 1 part of corrosive sublimate. The total difference in pounds of fat

credited to 3 creamery patrons' deliveries for the season, was 5.195 less on weekly composite tests, as compared with daily tests; 16.602 lbs. less by the semimonthly; and 12.205 lbs. less by the monthly composite test. All of these are considered to be within the limits of error.

There was no difference in temperature and acidity of cream whether kept in a well-glazed crock or in one that was chipped and cracked, but cream kept in the crock in every case had a bad aroma after from 44 to 52 hours. There was but little difference whether or not the cream was cooled before placing in a can or crock, or whether covered or uncovered, in a reasonably clean, cool cellar, although it is stated that further tests are needed. There was but little difference between a covered and open can as against the covered and open crock for holding cream in the cellar. The weight of evidence appeared to favor not covering the cream can or crock provided that the cellar air is pure and free from undesirable odors. In collecting cream in an ordinary milk can and in a wooden-jacketed can, the cream in the latter arrived at an average of 8.4° cooler than did the cream in the milk can, and with slightly less acidity.

The cost of pasteurizing cream for butter making was found to be a trifle over 3 cts. per 100 lbs. of butter. Powdered milk was found to be satisfactory in the preparation of cultures for ripening cream for butter making. Sodium carbonate, sodium bicarbonate, and lime were used as neutralizers for lowering the percentage of acidity in cream, and all produced a marked effect. Pasteurizing further reduced the acidity. "In all cases, except the one where washing soda was used, the cream churned in less time after partial neutralization of the acid before pasteurizing. To some extent this may have been due to less weight of cream in the churn for these lots. There was also a tendency for less loss of fat in the buttermilk from these lots, as compared with the normal lots. There was a little difference in the percentage of moisture and salt in the finished butter from the various lots. The 'overrun' was less in the lots where the cream was neutralized, as compared with the 'overrun' from similar lots not neutralized. In the 4 tests which are comparable, the average 'overrun' in the normal lots was 16.9 per cent, while the others averaged 13.2 per cent. The tendency was for a lower yield of butter in the lots where the cream was neutralized before pasteurizing. There was little or no difference in the average scores for flavor, or in the total scores of the 4 lots. The results by neutralizing with limewater before and after pasteurization of the cream were not decisive. More experiments on all these points are needed before drawing conclusions."

Experiments in pasteurizing resulted as follows: "The pasteurized cream churned at the same temperature, in less time, in all of the comparative tests with raw cream, except at 175° F., where the average time for churning was the same for the pasteurized and raw lots. There was not much difference in the percentage of fat in the buttermilks from the various lots, what difference there was being in favor of the raw cream lots. The percentage of overrun was slightly in favor of the unpasteurized lots. There was not much difference in the quality of the butter except in the lots heated at 175° F., which scored an average of nearly one point higher as compared with lots made from similar cream churned raw."

Various preservatives other than salt, used in butter making, were found to contain from 15 to 38 per cent of sodium chlorid. Butter churned to the size of wheat and corn granules contained more moisture and less salt than similar butters churned to the size of apples. Salt applied in wet form (2 lbs. of water to 5 lbs. of salt) caused a higher percentage of both moisture and salt to be retained in the finished butter.

The casein and cheese investigations were continued along the lines of previous years. The Holsteins produced the most milk, milk fat, and casein; the Ayrshires were second in the amount of milk and casein; and the Jerseys second in the amount of milk fat. The Jersey milk contained the highest percentages of fat and casein. "The single tests of casein in patrons' milk at 10 factories varied from 1.84 to 2.67 per cent. . . . The percentage of fat in the milk at western Ontario factories averaged 3.42, and for eastern Ontario 3.44. . . . The composite sampling for casein was not satisfactory—the tendency being for tests at too high, using the Hart casein tester. Milk ought to be tested at cheese factories, and be paid for on the fat-casein basis. In the meantime 'fat+2' is near enough for all practical purposes, and represents fairly close the available casein and fat in milk for cheese making."

Seasonal tests of fat in casein are also given. "The milks with the higher percentages of casein and fat, produced an average of 6.4 lbs. more cheese per 1,000 lbs. milk, as compared with the lots having lower casein and fat. (Last year it was 4.64.) The yields of cheese per pound of fat and casein were 1.50 lbs. from the lots with low casein and fat, and 1.571 lbs. from the higher casein and fat content milks." This difference is not sufficient to cause any great error by using the fat-casein method as a basis of payment. The cheese made from the higher fat-casein content milks contained 0.39 per cent more fat but there was little difference in the moisture content.

Curds from eastern Ontario averaged 2.249 per cent more moisture at the time of dipping, 0.574 higher in the green cheese, and practically the same in the cheese 1 month old than did the samples from western Ontario. The cheese lost more moisture when ripened in an ordinary room, at a temperature between 60 and 75° F., than in a room with a fairly uniform temperature of 40°. Most of the loss in moisture in ripening occurred in the rind, or the first quarter of an inch on the surface of the cheese, and during the first week of ripening.

As in the work of previous years there was a decided loss in making Cheddar cheese from overripe milk. In testing the effect of acidity, the yield of cheese was less with a high percentage of acidity in the milk at the time of adding the rennet, but the cheese was of a slightly poorer quality. The result of 2 years' work emphasizes the need of dipping with less than 0.2 per cent of acid. The tests with stirring confirmed the conclusion of the previous year, in that slightly stirring caused about one point higher scoring than where curds were not stirred, and about three-fourths point lower average scoring than with those from curds stirred "dry."

Eleven experiments comparing the effects of salting on the basis of weight of milk with salting based on weight of curd showed but little difference. It is advised that from 2½ to 2¼ lbs. of salt per 100 lbs. of curd be used rather than from 2 to 2¼ lbs., the heaviest salting producing the better flavor. One per cent shrinkage can be saved by placing the cheese within a week in a room at 40° to ripen, as compared with 60 to 75°.

VETERINARY MEDICINE.

The animal parasites of domestic and useful animals, J. FIEBIGER (*Die tierischen Parasiten der Haus- und Nutztiere. Vienna and Leipzig, 1912, pp. XVI+424, pl. 1, figs. 302*).—This is a text and handbook intended for use by students and veterinarians. The subject is dealt with in a systematic way under the main headings Protozoa, Vermes, and Arthropoda. Systematic lists of (1) the parasites and their hosts, (2) hosts and their parasites, with the part of the body infested, and (3) of such parasites that also attack man, are appended.

Researches on the spirochetes and related organisms, C. DORRILL (*Arch. Protistenk.*, 26 (1912), No. 2, pp. 117-240, pls. 5, figs. 5).—"From a comparative study of the spirochetes, bacteria, and Cyanophyceae, I have reached the following conclusions: The spirochetes may be collected into a single group, which may be called the Spirochaetoidea. The Spirochaetoidea are noncellular organisms (Protista). They undoubtedly belong to the Schizophyta (bacteria + Cyanophyceae), and not to the Protozoa. Among the Schizophyta, they must be placed in the subdivision bacteria and among the bacteria they probably constitute a group of the same systematic status as the cocci, the bacilli, or the Spirilla. The spirochetes differ from the other bacteria in only one feature—though actively motile, they possess no specialized organs of locomotion. Every other character which they possess is represented in other forms of bacteria.

"The group Spirochaetoidea comprises 4 different sets of organisms, which may be classified in the 4 genera Spirochaeta, Treponema, Cristispira, Saprospira."

A bibliography is appended.

The separation of protozoan species by means of immunity, A. F. COCA (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 12 (1912), No. 2, pp. 127-133; abs. in *Zentbl. Biochem. u. Biophys.*, 12 (1912), No. 23, pp. 938, 939).—"The results show that the various members of the same group (amoeba) can be differentiated with the specific agglutination and complement fixation reactions.

The nature of trachoma bodies, S. B. WOLBACH and S. H. MCKEE (*Jour. Med. Research*, 24 (1911), No. 2, pp. 259-264, pls. 5).—"The authors find that trachoma bodies, the discovery of which resulted in the introduction of the new term "Chlamydozoa" for a possibly new group of intracellular protozoa, including the bodies found in variola, vaccinia, scarlet fever, contagious epithelioma of fowls, molluscum contagiosum, rabies, and other diseases of animals, are not specific, nor are they parasitic in nature. "We have come to the conclusion that trachoma bodies are the product of mucus secretion under pathological conditions."

The filterable viruses, a summary, S. B. WOLBACH (*Jour. Med. Research*, 27 (1912), No. 1, pp. 1-25).—"This is a summarized account in which the author discusses 30 diseases produced by filterable viruses. (See also E. S. R., 27, p. 181.)

In regard to the action of the barium ions upon the heart, N. WERSCHLIN (*Arch. Expt. Path. u. Pharmacol.*, 66 (1911), No. 3, pp. 191-204; abs. in *Chem. Ztg.*, 36 (1912), No. 15, *Rept.*, p. 73).—"Like the substances contained in digitalis the barium ions inhibit systole and diastole. The difference, however, is only a qualitative one and is explained by the slight capacity which the barium ions have for penetrating (from without inward) the walls of a frog's heart. Barium ions can be easily removed from the heart by washing.

Researches on the poisons produced by *Aspergillus fumigatus*, E. BOUQUET and C. LENOIR (*Ann. Inst. Pasteur*, 26 (1912), No. 5, pp. 371-380).—"In continuing investigations with *A. fumigatus* (E. S. R., 18, p. 88), the authors find that instead of a single toxin at least 2 are produced by this fungus. One acts as a convulsant and is soluble in ether, the other is a depressant, insoluble or slightly soluble in ether and volatile.

Mortality of stock on mangels, C. ASTON (*Jour. New Zeal. Dept. Agr.*, 3 (1912), No. 3, pp. 214, 215; *Vet. Jour.*, 68 (1912), No. 445, pp. 425-427).—"The author reports briefly on investigations conducted following the loss in August of cattle and pigs which had been fed on mangels. Analyses of these mangels made during September showed the juice to contain 0.06 per cent of nitrites as nitrites and nitrates. Nitrites were present in traces, a fact which seems

not to have been recorded before in mangels, although mentioned as being found in other plant juices in small amounts. "The amount of nitrogen found is equivalent to 0.43 per cent of potassium nitrate, and a cow eating 60 lbs. of mangel juice would consume 116 gm. (4 oz.) potassium nitrate (mangels contain 95 per cent of juice)."

Catalase and reductase tests in dairy inspection, L. A. KLEIN (*Cornell Vet.*, 2 (1912), No. 1, pp. 6-20, fig. 1).—A description and a discussion of the advantages to be derived from the use of these tests in dairy practice. A review of the literature is also given.

Report of proceedings under the diseases of animal acts for the year 1911, T. P. GILL (*Dept. Agric. and Tech. Instr. Ireland, Rpt. Diseases Anim., 1911*, pp. 63, pls. 3).—This includes a special report on hog cholera and other diseases of animals in Ireland in 1911, by M. Hedley; and a special report on the transit of animals, by D. S. Prentice. Statistical data are presented in appendixes.

Annual report on the civil veterinary department, United Provinces, for the year ending March 31, 1912, E. W. OLIVER (*Ann. Rpt. Civ. Vet. Dept. United Prov., 1912*, pp. 11-23).—This annual report includes accounts of the occurrence of contagious diseases of animals, breeding operations, etc. Statistical data are appended.

Toxin formation by the anthrax bacillus, A. MARXER (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig.*, 13 (1912), No. 4, pp. 309-328).—Asporogenic anthrax bacilli produce a heat-stable endotoxin in large amounts. Spore-forming varieties yield the toxin only in small amounts. By injecting this toxin into animals symptoms are produced which simulate those produced by Friedberger's anaphylatoxin or from an extract of the typhoid bacillus (Aronson's extract). The urine from the animals treated with the endotoxin (and presenting the symptoms of shock) when injected into other subjects produced typical anaphylaxis. Like the endotoxins of some other bacteria the treatment of animals with the endotoxin produces no antitoxin in the blood.

Ascoli's reaction for diagnosing anthrax, F. DE GASPERI (*Rev. Gén. Méd. Vet.*, 18 (1911), No. 214, pp. 553-562).—Attempts to obtain the reaction with the spleens and similar material from animals affected with pseudo-anthrax and specific anthrax serum resulted negatively.

The detection of anthrax with the precipitin reaction, W. PFREILER (*Berlin. Tierärztl. Wchnschr.*, 28 (1912), Nos. 9, pp. 149-151; 10, pp. 167-169).—A critical exposition of the precipitin reaction as applied to the detection of anthrax.

Diagnosis of anthrax with the aid of the bone marrow, F. WULFF (*Berlin. Tierärztl. Wchnschr.*, 28 (1912), No. 24, pp. 421-423).—The bone marrow taken from either the diaphysis or epiphysis can be used for detecting the presence of the anthrax bacillus for the purpose of diagnosing the disease. The method proposed gave positive results in instances where the blood or spleen was negative.

In regard to the so-called immunization of anthrax bacillus according to Danysz, W. LÉVADY (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 60 (1911), No. 6, pp. 27-531).—Anthrax bacilli (Pasteur vaccine), cultivated in arsenic bouillon or rat serum, when subsequently grown on agar appear as a slimy culture containing encapsulated bacilli. The reason for this, in the author's opinion, is that the vaccine originally contains organisms which are capable of forming capsules about themselves. According to this an immunization as expressed by Danysz (*E. S. B.*, 13, p. 92) can not be achieved.

Normal virulent anthrax bacilli, when grown according to the above mentioned methods, show no morphological changes.

Bacillus bronchisepticus (Bronchicanis); The cause of distemper in dogs and a similar disease in other animals, N. S. FEARY (*Vet. Jour.*, 68 (1912), No. 445, pp. 376-391, table 3).—This is a general account of the disease in which the author summarizes the present status of our knowledge concerning it, together with a report of investigations conducted in continuance of those previously noted (E. S. R., 25, p. 787).

The infectivity of parts of organs of glandered horses, the complement fixation reaction with guinea pigs, and some curative and immunizing tests, H. MIESSNER (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 64 (1912), *Festschrift P. Loeffler*, pp. 121-151, pl. 1).—Only one-quarter of the guinea pigs infected with pieces of the organs of glandered horses became glandered. According to this, the results obtained with the infection test must be interpreted with care. Guinea pigs infected with defibrinated blood rarely took the disease. Guinea pigs infected with either the organs or blood of glandered animals can only be considered glandered when the findings of the complement fixation test have been confirmed by the autopsical findings or the animals have gone through the course of a light form of the disease during their lifetime. Therefore the complement fixation reaction, when used for diagnosing glanders in guinea pigs, i. e., infection tests, can not be relied upon.

Guinea pigs were treated with mallein or a killed culture of the glanders bacillus for the purpose of determining whether the serum of these animals behaves as does that obtained from horses pretreated in the same way. This was answered in the affirmative with the aid of the complement fixation test. Artificial and natural gastric juice did not seem to have any particular bactericidal action for the glanders bacillus. Glanders bacilli placed directly in the stomach of guinea pigs produced glanders in these animals. Horses which were fed cultures of *Bacillus mallei*, given with the food, did not contract the disease. Immunizing tests with antiformin solutions of the glanders bacillus and guinea pigs showed that a single or a double treatment (given subcutaneously or intra-abdominally) did not produce an immunity in these animals. The salvarsan treatment was not effective for glanders.

The mallein test and its "vagaries," H. G. SIMPSON (*Vet. Rec.*, 24 (1912), No. 1226, pp. 417-430).—In this article are discussed the relation between local and thermal reactions and the number and age of lesions found on post mortem, irregularities of the local manifestation, deferred and double local reaction, "lungers," and the results of a large number of tests and autopsies conducted by the author.

Leishmaniasis and babesiasis in Yucatan, H. SEIDELIN (*Ann. Trop. Med. and Par.*, 6 (1912), No. 2, pp. 295-300, fig. 1).—The author states that a cattle importer has estimated that the loss of imported cattle due to splenic fever (piroplasmosis) would reach as high as \$70,000 within a period of 3 months. Native cattle are said to suffer from the disease in a mild form. A chronic case of canine piroplasmosis is reported to have been observed.

The hemolytic action of mastitis milk, F. MOSER (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 65 (1912), No. 4-5, pp. 269-296).—The milk from animals affected with mastitis as a rule contains complement, the amount, however, being subject to a great many variations and dependent to quite an extent upon the degree of inflammation. Milk which has a normal appearance contains little or no complement. Hemolytic amboceptor was not noted. The hemolytic method is considered of no value for practical purposes because simpler methods are at our disposal.

The pathological anatomy of natural and experimental murrina—a typhoid disease of the Isthmus of Panama, S. T. DARLING (*Jour. Nat. Research*, 26 (1912), No. 2, pp. 219-247, pls. 2).—In this paper the author reports

studies of the pathological changes elicited in a variety of animals naturally and experimentally infected with *Trypanosoma hippicum*, namely, native horses, American mules and work horses, dogs, raccoons, monkeys, *Cebus hypoleucus*, *Macropithecus* sp., rabbits, guinea pigs, rats, mice, and coat.

Trypanosomes infecting game and domestic stock in the Luangwa Valley, northeastern Rhodesia. A. KINGHOEN and W. YORKE (*Ann. Trop. Med. and Par.*, 6 (1912), No. 3, pp. 301-315).—"Trypanosomes are of frequent occurrence in game and domestic stock in the Luangwa Valley. At least 37.5 per cent of the buck harbor parasites. Six species of trypanosomes were found, viz, *Trypanosoma rhodesiense*, *T. vivax*, *T. nanum*, *T. pecorum*, and 2 others, of which one was possibly *T. montgomeryi*.

"*Glossina morsitans* in nature transmits 2 of these trypanosomes, viz, *T. rhodesiense* and *T. pecorum*, and probably also transmits at least 2 others, viz, *T. vivax* and *T. nanum*. Circumstantial evidence exists to show that *T. pecorum* may be transmitted by biting insects other than tsetse flies."

Serological methods for diagnosing trypanosome diseases. F. RUPPERT (*Berlin. Tierärztl. Wchnschr.*, 28 (1912), No. 22, pp. 381-383).—This is a study and description of serological methods for diagnosing dourine and nagana with the aid of agglutination, precipitin, the Porges-Meier reactions, and the complement fixation method. Good results were obtained with the first 3 methods, but the tests with the complement fixation method were not conducted under ideal conditions.

The relation of animal fat to tubercle bacillus fat. W. C. WHITE and A. M. GAMMON (*Jour. Med. Research*, 26 (1912), No. 2, pp. 257-266).—In this paper the results of a preliminary study of the behavior of various animal and vegetable fats, viz, stearic acid, oleic acid, palmitic acid, linolic and linoleic acid, and butter and human fat with tubercle bacilli growing on glycerin agar, are reported. Olive oil was used as a source for the oleic acid, palm oil for the palmitic acid, linseed oil for linolic and linoleic acids, and beef suet for the stearic acid. On the basis of the results obtained the authors suggest an explanation for the caudal lobe lesions in cattle and the apical lesions in tuberculosis of man, as follows:

The pulmonary artery, before dividing into the right and left pulmonary branches, forms a great bay of blood bounded by a very elastic vessel wall. The blood in this portion of the pulmonary artery must move with comparative slowness, because of the short circuit which it makes in comparison with the long circuit made by the general aortic quota of blood. In this great bay the blood is loaded with fatty derivatives of low specific gravity compared with the whole blood. Owing to the slowness of the current, these compounds have a chance to rise to the surface of the stream, so that the upper layer of blood in the pulmonary artery should have a much larger content of fatty compounds than the lower one. At the highest point of this main blood stream in man the vessel arises that supplies the apex of the upper lobe on either side, so that if the theory advanced be correct, this vessel should be the vessel most laden with the fatty compounds of low specific gravity which are being poured into the pulmonary stream by the liver mechanism. "This view, coupled with the results of our experimental work so far completed, which shows that the tubercle bacillus makes use of these compounds for its more abundant growth, seems a most reasonable explanation of its more prevalent development in the apex of the upper lobe."

The relations between the human and the bovine type of tubercle bacillus. S. WOODHEAD (*Lancet* [London], 1912, I, No. 22, pp. 1451-1457).—This is an address delivered at the International Conference of Tuberculosis, held at

Rome in April, 1912. It deals principally with the findings of the British Royal Commission on Tuberculosis (E. S. R., 23, p. 384).

Human and bovine tuberculosis, H. VALLÉE (*Rev. Vét. (Toulouse)*, 37 (1912), No. 6, pp. 350, 351).—The author believes that the disease is transmissible from animal (bovine) to man, particularly to infants. The majority of cases in man, however, are deemed due to transmission from man to man.

The relative importance of the human and bovine type of tubercle bacilli for the production of tuberculosis in man, A. CALMETTE (*Rev. Hyg. et Pol. Sanit.*, 34 (1912), No. 4, pp. 349-357).—Repeated contact or infection with large doses of the bovine type of bacillus will produce tuberculosis in man, especially in young children. The greatest source of danger lies in the communication of the disease from man to man. This is shown by the occurrence of pulmonary tuberculosis in countries where no tuberculous cows are present and where no cow's milk is fed to the young.

The complement fixation reaction in tuberculosis, C. HAMMER (*München. Med. Wchnschr.*, 59 (1912), No. 32, pp. 1750-1752; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 54 (1912), Beiheft, p. 201).—Forty-three out of 46 cases of the disease in man were diagnosed by this method. Of the cases recorded 35 were pulmonary, 7 surgical, 1 glandular, and 3 lupus. In addition to this the test gave positive results in 20 out of 26 cases of suspected tuberculosis in bovines. On autopsy 19 out of the 20 reacting animals showed the lesions of tuberculosis. Some of the lesions were very slight.

The sero diagnosis of bovine tuberculosis, HAMMER (*Deut. Tierärztl. Wchnschr.*, 20 (1912), No. 39, pp. 593-596).—This is a continuation of the work reported in the abstract above and gives in detail the technic used in the experiments and some additional results obtained with 96 bovines.

Of these 96 animals 48 were found to be tuberculous upon slaughter and 48 free from the disease. The complement fixation test with the same lot of animals showed 50 to be tubercular and 46 healthy. The antigen employed was made from a tuberculous peritoneal nodule and old tuberculin.

The cooperative dairy industries in Germany and stamping out tuberculosis according to the new national epizootic law (*Molk. Ztg. Berlin*, 22 (1912), No. 25, pp. 290, 291).—This is a discussion of this law as it applies to the cooperative dairies of Germany. The methods for treating the milk obtained from infected animals, results of the clinical examination of the animals, and notes on their elimination from the herds are also included.

The lymphatic system of the bovine, H. BAUM (*Das Lymphgefäßsystem des Rindes. Berlin*, 1912, pp. XII+170, pls. 32).—This work consists of 4 parts. The first or general part (pp. 1-10) deals with technique, terminology, etc.; part 2 (pp. 11-53) with the lymph-nodes; and part 3 (pp. 54-162) with the lymphatic vessels. In part 4 (pp. 163-165) the lymph-nodes and lymphatic vessels of the different parts and regions of the body are brought together. The work is illustrated by colored plates and a bibliography of 60 titles is appended.

The nature of the marginal points occurring in the blood corpuscles of cattle, M. KOIZUMI (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 65 (1912), No. 4-6, pp. 337-340, pl. 1).—Studies of blood smears taken from cattle in the southern part of Formosa, where an endemic disease closely allied to Texas fever is found, have led the author to conclude that it is due to *Babesia (Piroplasma) bovina*. The marginal points are thought by him to represent a stage of *Babesia* since they remain for a long time in the blood corpuscles of recovered cattle and serve as a source of infection to new comers.

"When cattle are on the way to recovery the marginal points as described by Smith and Kilborne make their appearance in addition to the large forms. For sometime afterwards, both large forms and small bodies are found in the

as proportions. As the animal continues recovering its health, the former become gradually reduced in number until finally the latter only comes to be found in blood. . . . While studying blood smears of cattle in which both the normal forms and the marginal points are found together, I could find several intermediate forms between these 2 and the course of formation of the former from the latter."

The author states that he can not accept the view that all of the marginal points, or coccus-like bodies, are no other than *Anaplasma marginale*. "I can not but believe that *Babesia bigemina* at least, takes a form of the marginal points in its life cycle as believed by Smith and Kilborne, Knuth, Ollwig, and Manteufel. . . . I also had opportunities of examining such forms in blood of calves, mice, and rats. And it was found that they are clearly distinguished from the marginal points appearing in the life cycle of *B. bigemina*."

Some notes and suggestions in connection with the etiology of bovine onchocerciasis, J. B. CLELAND (*Jour. Trop. Med. and Hyg. (London)*, 15 (1912), No. 15, pp. 232-235).—A further discussion of the etiology of this disease (E. S. R., 25, p. 887).

It appears most likely that *Stomoxys calcitrans* is the insect host concerned in the transmission of the embryo of this parasite from host to host. Since embryos from the worm nests are occasionally liberated into the blood stream, this fly has an opportunity to imbibe one or more of the sparsely distributed embryos and, after a partial development, to inoculate a fresh vertebrate host therewith.

Streptotrichosis in a bullock in India, G. K. WALKER and R. BRANFORD (*Vet. Jour.*, 68 (1912), No. 447, pp. 541-545, figs. 4).—The author records a case of this disease in a bullock in the Punjab.

Notes on the muscular changes brought about by intermuscular injection of calves with the virus of contagious pleuro-pneumonia, W. H. BOYNTON ([*Philippine*] *Bur. Agr. Bul.* 20, 1912, pp. 10, pls. 4).—"From all appearances the contagious pleuro-pneumonia virus seems to have a specific action upon muscle and connective tissue, affecting chiefly the connective tissue elements. The appearances suggest that the virus multiplies in the lymph spaces of the connective tissue and blood vessels, gradually working its way through the walls of the blood vessels, causing an inflammation of the intima and thus giving rise to thrombus formations. The virus having invaded the tissue gives rise to a serofibrinous exudate, intermingled with groups of leucocytes leading to thrombosis of both lymph and blood vessels.

"The muscle lesions correspond with the lung lesions of contagious pleuro-pneumonia in the following respects: Thrombus formation in the veins in both tissues; the inflammatory areas around the blood vessels are similar; the connective tissue is chiefly affected in both tissues; the abundant serofibrinous exudate is present in both; the deep staining line of leucocytes along the edge of the connective tissue is characteristic in both tissues; the tendency toward a chronic productive inflammation is present in both."

A study of the normal blood of the carabao, W. H. BOYNTON ([*Philippine*] *Bur. Agr. Bul.* 21, 1912, pp. 12).—Twenty-five animals in normal condition, from 2½ to 6 years of age, were used in the studies here reported.

"In the circulating blood of supposedly normal carabaos over 2 years old the red corpuscles were found to average 6,057,520 per cubic millimeter. The average percentage of hemoglobin was 92.6. The average number of leucocytes was 10,380 per cubic millimeter. The average specific gravity found was .0632. The relative volume of corpuscles to plasma was found to be 29.1 per cent of corpuscles to 70.9 per cent of plasma. The average time for complete coagulation of the blood was found to be 3 minutes and 16 seconds plus."

Of the 5 varieties of leucocytes found in the peripheral blood, 48.5 per cent were lymphocytes, 4.6 per cent large mononuclears, 34.5 per cent polynuclears, 11.5 per cent eosinophiles, and 12 per cent mast cells.

Contributions to the knowledge of the involution of the normal uterus of the goat, G. HAENISCH (*Beiträge zur Kenntnis der Involution des normalen Uterus der Ziege. Inaug. Diss., Univ. Leipzig, 1911, pp. 64, pls. 4*).—A report of studies of 32 individuals. A bibliography of 30 titles is appended.

Notes on the attenuation of virus in the blood of cholera hogs to prepare a vaccine, R. GRAHAM (*Amer. Vet. Rev., 41 (1912), No. 3, pp. 330-334*).—Tests were made for the purpose of determining the advisability of using hog-cholera vaccines heated to 60° C. for immunizing against this disease.

The results show that the inoculation of a virus attenuated at 60° for 1 hour does not produce a sufficient immunity to protect hogs against this disease. It also usually presents the additional danger of actually producing hog cholera, as was shown in the experiment. The temperature to which the liquid blood must be heated to produce a reliable vaccine is variable, and the same dose of vaccine may kill, protect, or nonprotect, upon inoculating animals of the same size under similar surroundings. Virus attenuated by heating to 60° when not carbolized will remain virulent for at least 24 days.

Vaccination against hog cholera, F. S. SCHOENLEBER (*Kansas Sta. Bul. 182, pp. 439-464*).—Of 292,400 hogs vaccinated with the serum produced at the Kansas College during 1911 reports were received in regard to 32,894 head, which had been given the serum treatment alone, the serum-simultaneous method, or the author's combination method, i. e., serum alone followed in 10 days by the serum-simultaneous method, with results as follows:

General summary of Kansas hog-cholera vaccinations.

Condition of herd.	Method.	Number of herds.	Number of vaccinations.	Number of deaths.	Number of recoveries.	Percentage recoveries.
Diseased.....	Serum alone.....	235	16,543	5,031	11,506	69.55
Noninfected.....		145	9,350	24	9,326	99.22
Total.....		380	25,893	5,055	20,832	80.30
Diseased.....	Simultaneous.....	8	657	52	605	92.00
Noninfected.....		33	2,565	82	2,483	96.80
Total.....		41	3,222	134	3,088	95.90
Diseased.....	Double.....	14	908	388	521	57.30
Noninfected.....		18	2,870	24	2,846	99.17
Total.....		32	3,779	412	3,367	89.09
Diseased.....	All methods.....	257	18,109	5,471	12,632	69.75
Noninfected.....		196	14,785	130	14,655	99.13
Total.....		453	32,894	5,601	27,287	82.65

In addition to the above the bulletin discusses in a clear and concise way the 3 methods of vaccinating, the Kansas state law, immediate effects of vaccination, losses, care of hogs before and after vaccinating, instruments, the serum and its production, controlling the disease, when and when not to vaccinate, effect of vaccination on the offspring, stocking up after an outbreak, forms of the disease, conditions favoring the disease, conditions or diseases which resemble cholera, manner of infection, period of incubation, prevention of the disease, disinfection, post mortems, and a few precautions and hints.

Ascoli's thermoprecipitation reaction as a diagnostic aid for swine erysipelas, M. IWICKI (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 23, pp. 101*).

1909).—This is a study of the Ascoli method as applied to the diagnosis of trypanos in hogs. The organs used were the kidney and spleen. In some cases both were employed.

Although a few negative results were obtained with positive material, the author believes that the method can be used providing a specific serum of the proper strength is employed. Special emphasis is placed on the point that some additional work will have to be done in regard to preparing a more suitable serum for this purpose.

Infection with *Bacillus aerogenes capsulatus*, S. A. DEMING (*Amer. Jour. Vet. Med.*, 7 (1912), No. 9, pp. 365, 366).—The author reports observations of a case of this infection in the mule in Iowa.

The condition of the digestive tract in parathyroid tetany in cats and dogs, A. J. CARLSON (*Amer. Jour. Physiol.*, 30 (1912), No. 4, pp. 309-340).—"There are no spasms, contractures, or other evidence of hyperexcitability or tetany of the neuro-muscular mechanisms of the digestive tract in parathyroid tetany in cats and dogs. Even in very severe tetany the movements of the stomach and the intestines may be normal. The deviation from normal is in the direction of depression or paralysis."

Observations on fowl and ducks in Uganda with relation to *Trypanosoma gallinarum* and *T. gambiense*, H. L. DUKE (*Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 580, pp. 378-384, pl. 1).—The author concludes that *T. gallinarum* can multiply in the gut of *Glossina palpalis*, although this fly is probably not the normal host. Muscovite ducks are not thought capable of acting as a reservoir for *T. gambiense*.

RURAL ENGINEERING.

The storage of water for irrigation purposes.—I, Earth-fill dams and hydraulic-fill dams. II, Timber dams and rock-fill dams, S. FORTIER and F. L. BIXBY (*U. S. Dept. Agr., Office Expt. Stas. Bul.* 249, pts. 1, pp. 95, pls. 20, figs. 41; 2, pp. 64, pls. 8, figs. 38).—Small and medium sized reservoirs are deemed as urgently needed to provide additional water supply for arid lands as are large reservoirs and to have a more extended use, especially in the late summer seasons if the stream flow is short and water is needed for stock and the more valuable crops such as alfalfa, potatoes, sugar beets, sugar cane, and orchards. In this bulletin the types of dams suitable to small reservoirs only are considered. Several different types of these dams and several specific structures with cost data are described, and a large amount of information is given relative to the proper location, construction, and lining of the reservoirs, the different methods of location and design, and the equipment, methods, and material of construction of these dams with spillways, gates, valves, conduits, and all operating machinery.

Tests indicate that in earthen dam construction it is advantageous to use a mixture of materials ranging from fine to coarse to effect as high a degree of compactness as possible, and that the foundation should be on firm and reasonably dry ground. In hydraulic-fill dam construction the features to be considered are a supply of water with a flow of from 2 to 20 cu. ft. per second under a pressure of from 40 to 75 lbs. per square inch; suitable material such as may be readily sluiced into place and will give the required degree of compactness, stability, and imperviousness; and available quantities of this material close enough by to make transportation by the hydraulic method practical. The timber dam is regarded as a suitable and economical structure in all the smaller and less expensive irrigation systems because of its cheapness in first

cost, ease and rapidity of construction, and its adaptability to a wide range of conditions and locations. In rock-fill dams the greater part of the structure consists of loose rock dumped into place and rendered impervious by the use of earth, lumber, concrete, or steel, the size of the dam and the ultimate cost of obtaining and placing the materials determining which is preferable in each case. The mass and weight of the rocks provide the necessary stability against water pressure and overturning and sliding tendencies.

Shallow pumping for irrigation in the West, W. L. WILDER (*Mid-Continent*, 5 (1912), No. 7, pp. 14-17, figs. 7).—This general discussion of shallow irrigation pumping in the West indicates that the best sources of cheap power on the farm at the present time are the gasoline engine and the electric motor. To these are considered due the success of shallow irrigation pumping. Several forms of pumps and water-lifting devices in present use are described.

Irrigation by pumping in western Kansas, F. D. CORBURN (*Topeka, Kans.*, 1912, pp. 12, figs. 3).—The author discusses the possibilities presented by irrigation pumping in western Kansas, describing several private pumping plants in use which give satisfaction and showing that whenever irrigation by pumping from deep bored or artesian wells may be done to supplement rainfall it will bring about great increases in crops.

A new method of subirrigation (*Texas Farm Co-operator*, 35 (1912), No. 35, pp. 1, 2).—A description is given of a subirrigation system in Texas in which the water is distributed by concrete pipe, the main pipe, 4 in. in diameter, running the length of a field and feeding 2-in. lateral pipes which are laid at intervals of 33 ft. At intervals of 3 ft. small holes are made in the tops of the lateral pipe in which are inserted small plugs with pin hole end openings. Concrete caps are placed over these plugs, leaving just enough space to allow the water coming through the plug to percolate from under the cap and into the soil. It is claimed that a well with a capacity of only 40 gal. per minute furnishes sufficient water to irrigate 20 acres, using a 4½-in. working barrel pump driven by a 2-horsepower engine. The advantages presented by this system are the great savings of land and water.

Overhead irrigation in the citrus grove (*Pacific Rural Press*, 84 (1912), No. 2, p. 28).—A system of overhead irrigation is described in which galvanized iron pipe lines are run underground through every alternate row of trees, and stand pipes 15 ft. high are raised through every fourth tree, the water being distributed through rotary sprinklers. The head pipe is 4 in. in diameter and is tapped by 17 rows of 1½ in. pipe, which reduces to 1½ in. toward the center and to 1 in. along the lower third. The branch pipes to individual trees are ¾ in. and the stand pipes ¾ in. The pumping is done by electricity and the cost of the system was about \$150 per acre.

Super-elevation of water surface in passing around curves at high velocities (*Engin. and Contract.*, 33 (1912), No. 1, p. 24, figs. 2).—A mathematical discussion is given providing for a raise in the outside walls of irrigation canal curves to prevent loss of water due to superelevation.

[Duty of water], W. W. McLAUGHLIN (*Mid-Continent*, 5 (1912), No. 5, pp. 25, 26, fig. 1).—This is a general discussion of the meaning of the duty of water, presenting the opinion that this should be based entirely upon the economic productive power of the water, including net return on money invested, labor and equipment required, and the marketable qualities of the crop produced, rather than on the amount of water required to produce a certain quantity of crop, and thus distinguishing between primitive methods and modern scientific methods of irrigation.

Notes on irrigation in Cape Colony, J. MULLIS (*Bul. Agr. Compo Belg.*, 3 (1912), No. 2, pp. 257-290, pl. 1, figs. 25).—A general discussion of the

geography and meteorology of Cape Colony is followed by notes on the cost of irrigation per acre, the value of irrigated lands, surface and subsurface waters, irrigation work, duty of water, and the general extent of irrigation in the colony.

[Practical problems in irrigation, drainage, and hydraulics on the farm]. W. B. GAZCOY (*Hacienda*, 7 (1912), No. 10, pp. 291-299, figs. 20).—This article deals with irrigation and drainage and general agricultural hydraulics, discussing the selection and installation of power machinery, pumps, etc., for irrigation pumping, the preparation of the soil for irrigation, the amount and frequency of irrigation, drainage of irrigated lands, drainage by hydraulic machinery, and the possibilities of converting hydraulic energy into electrical energy.

Canada's drainage problem, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 37 (1911), pp. 65, 66, fig. 1).—It is stated in this report that in Ontario as a whole there are from 25,000,000 to 30,000,000 acres of land needing drainage, for much of which large outlets must be provided by the government. The increased crop returns for the entire Dominion following drainage are estimated at several billions of dollars per annum.

Plans for and estimates of costs of draining 33,000 acres of swamp land in North Carolina (*Engin. and Contract.*, 37 (1912), No. 20, pp. 565, 566, figs. 2).—Ten different ditches are included in this work, designed to carry 1 in. run-off per 24 hours with side slopes of 1:1 and a minimum width of 14 ft. The cost of the entire work is estimated at \$142,621, or about \$4.32 per acre.

A good form of tiling contract, F. O. NELSON (*Successful Farming*, 11 (1912), No. 8, p. 18).—A form for contracts between landowner and tiling contractor to be used in all cases, thus eliminating the usual unsatisfactory verbal contract on small tile drainage jobs, is suggested.

[Experimental road work near Baltimore, Md.], W. W. CROSBY (*Good Roads*, n. ser., 4 (1912), No. 10, pp. 93-99, figs. 7).—This is a summary with tables of results and costs of experiments with the penetration method of bituminous road construction. The road is about $6\frac{1}{4}$ miles long and varies from 14 to 24 ft. in width. The old macadam surface was scuffed, reshaped, and the foundation strengthened where necessary. It was rolled and covered with a 4 in. layer of 1 to 2 in. crushed stone with a $\frac{1}{2}$ in. per foot crown. This was rolled to the utmost possible compaction and hot pitch applied and evenly distributed. A thin coating of $\frac{1}{4}$ to 1 in. clean stone chips was placed on top to absorb the excess pitch and fill the extra voids, the quantities of pitch and stone chips varying greatly per square yard under different circumstances. Some sections of the work were made of ordinary water-bound macadam with a top coat of cold pitch and stone chips.

Where the quantity of pitch used was in excess of 1.7 gal. per square yard the bleeding of the pitch in hot weather and the slipperiness in cold weather were found particularly objectionable, especially where tars were used. On the whole, after from 2 to 3 years, the condition of most of the sections is deemed satisfactory, the cost being the only questionable feature.

Road building by convict labor in Colorado, T. J. TYNNAN (*Threshermen's Rev.*, 21 (1912), No. 5, pp. 59, 60, 62).—Attention is called to the use of convict labor in Colorado for road building, as being much cheaper than other labor. It is noted that 50 miles of rock road were constructed at a cost of \$1,134 per mile, which by ordinary labor would have cost \$25,000 per mile.

Concrete roads in the country, N. A. CLAPP (*Farmers' Rev.*, 44 (1912), No. 20, p. 532, figs. 3).—Attention is called to the progress of concrete road construction in Wayne County, Mich., briefly reviewing methods of construction

and noting the commercial and social advancement of the community. The cost of these roads is about \$16,000 per mile.

An act creating a state highway department and providing aid in construction and maintenance of highways (*Ohio Highway Dept. Bul. 14, 1911, pp. 19*).

[Reducing the cost of farm power], D. C. SHAFER (*Tribune Farmer* [N. Y.], 11 (1912), No. 561, pp. 2, 21, figs. 4).—This article enumerates as the 3 reliable sources of farm power internal combustion engines, electricity, and water power, and discusses their use in connection with the heavy work ordinarily performed by men and horses. The fallacy of installing low voltage electric power systems is pointed out and methods of harnessing and transmitting small water power are outlined.

Electricity on the farm, P. A. BATES (*Nat. Land and Irrig. Jour.*, 6 (1912), No. 2, pp. 6-8, figs. 9).—This article deals with the use of electricity for operating cream separators, churns, milking machines, and dairy refrigerators in small farm dairies and describes installations in present use.

The storage battery in isolated lighting plants, T. MILTON (*Gas Engine*, 14 (1912), No. 7, pp. 353-356).—Investigations of the storage battery when used in connection with isolated electric systems indicate that by the use of storage batteries, electric light and power may be had for 24 hours by operating the gas engine and dynamo a much shorter time.

The power windmill and electric lights on the farm, F. FORREST (*Wis. Farmer*, 41 (1912), No. 30, p. 709, fig. 1).—A description of a farm power plant driven by a windmill which operates several machinings by belt and shaft drive and also an electric generator for electric light, the entire cost of the plant being about \$250.

[Running and maintenance of the internal combustion engine] (*Gas Engine*, 14 (1912), No. 9, pp. 482-485).—Notes are given on the starting, running, and maintenance of internal combustion engines with directions for maintaining the following conditions on which the good working of the engines depend: Suitability and steady supply of fuel, correct fuel mixture, sufficient compression, correct valve and ignition timing, efficient governing, good water circulation in the jackets, good but not excessive lubrication, and general cleanliness.

Selection and care of gas traction engines and equipment, F. H. CROSSMAN (*Canad. Thresherman and Farmer*, 17 (1912), No. 6, pp. 30, 32).—The author recommends for private work a 15 to 30 horsepower, single cylinder, throttle governed, water-cooled, gas or kerosene engine, and for a general public plowing business a 30 to 60 horsepower, oil-cooled, gas or kerosene engine. He gives brief directions for the care and use of the engine and its equipment, and suggests a list of tools and other handy equipment.

[The gas engine governor], C. W. HULL (*Gas Engine*, 14 (1912), No. 9, pp. 479, 480).—Directions are given for the care of the governing mechanism on internal combustion engines, more especially on the hit-and-miss governed type. It is stated that the speed should be controlled with minimum variation from no load to full load and from full to no load in order to prevent injury to the engine due to sudden speed changes, to obtain the best results from the driven machinery, to give fuel economy, and to save the time wasted by hand regulation.

Some lubrication problems, A. E. POTTER (*Gas Engine*, 14 (1912), No. 7, pp. 345-348).—This is a paper read before the National Gas Engine Association at Milwaukee, in which the author discusses gas engine lubrication. He states that the simplest and easiest gas engine to lubricate efficiently is the horizontal 4-cycle engine, and maintains that every vertical gas engine piston

should have a ring at its lower extremity, in addition to the usual piston rings, to create a pressure to force oil accumulations to the wrist-pin bearings rather than to the combustion chamber. He points out the evils of the splash and flushing systems of lubrication and advocates the automatically regulated pressure pump system used in most foreign designs. He discusses the fire, cold, and viscosity tests of oils, and states that a high-fire test, fairly thin oil is best adapted to vertical engines using a positive, force-feed lubrication system, while a low-fire test oil better answers the requirements where splash systems are employed, on account of allowing for a sure sufficiency for a less positive system in order that the excess oil may be more completely consumed in the combustion chamber.

Cooling the farm engine. J. H. BEATTIE (*Farm Machinery*, 1912, No. 1072, pp. 13, 16).—Attention is called to the importance of keeping the cylinder of a gasoline engine cool, and several farm engines are described which are cooled by air, water, or oil.

A gas locomobile. L. DUBOIS (*Jour. Agr. Prot.*, n. sér., 23 (1912), No. 21, pp. 654, 655, figs. 2).—A description is given of a power and tractor outfit consisting of a combination of internal combustion engine and gas generating equipment. The engine is a 4-cycle, water cooled type manufactured in sizes of from 8 to 55 horsepower, and burns the gas direct from the attached generator.

Problem of the small tractor. L. W. ELLIS (*Farmer's Advocate*, 47 (1912), No. 1082, pp. 960, 961, figs. 4).—This is a paper read before the National Gas Engine Trades Association at Milwaukee.

The author discusses the small tractor problem confronting tractor designers and compares American with foreign design. The French designers have dealt most extensively with small, all-service tractors, and combinations of tractor engine with plowing and cultivating devices, with indifferent success, while the Americans have dealt almost exclusively with large tractors for heavy work. "Practically every idea submitted abroad has been the subject of original investigation and experiments in this country, and actual experience has shown the impracticability of many of what are superficially regarded as essentials of the small tractor."

Why a kerosene tractor? R. OLNEY (*Irrig. Age*, 27 (1912), No. 10, pp. 372, 373, figs. 4).—A discussion of the fuel question for internal combustion tractors, giving a comparison of the costs of using gasoline and kerosene in a special type. With this tractor plowing was done with gasoline for 72.6 cts. per acre and with kerosene for 58.6 cts. per acre.

Can tractor rating be standardized? (*Canad. Thresherman and Farmer*, 17 (1912), No. 7, pp. 44b, 44c).—A discussion of the problem of a standard system of rating for tractors. One opinion expressed is that since a tractor is required to operate under widely varying conditions of soil, roadway, and weather, a conservative brake horsepower rating of 20 per cent below the possibly developed brake horsepower should be adopted, while another opinion is that a standard method of testing could be adopted requiring the use of a pair of drums mounted on a shaft running on roller bearings and connected to a Prony brake. The tractor should be made to climb planks into such a position that the traction wheels would be in contact with and supported by the drums and held in this position by a draw-bar dynamometer connected to a post. By this apparatus and by scales under the front wheels and the draw-bar dynamometer, the load on the traction wheels when pulling and at rest, giving the axle torque and the horsepower delivered, including rolling friction of the tires, and readings in connection with the traction wheel tire speed, can be obtained.

Motor plows and ground-breaking machinery. HOLLDACK (*Jahrb. Deut. Landw. Gesell.*, 27 (1912), No. 1, pp. 203-219, pls. 15, figs. 11).—A discussion is

given of motor plows and ground breakers in general, describing some special improved types, including combinations of motor and high-speed rotating ground breakers and presenting a graphical discussion of the losses in the drive wheel by slipping and sinking and special improved types of drive-wheel rim to prevent this.

The application of motor plows, B. FREUND (*Wiener Landw. Zig.*, 63 (1912), No. 45, pp. 543, 544).—A description and discussion are given of three systems of motor plowing, namely, the rope and windlass system, the drag system, and the combination tractor and ground-breaker system, giving tables showing the horsepower, revolutions per minute, weight, fuel, required, cost of operation, and initial cost of the different makes of each system.

[A powerful ditching machine] (*La. Planter*, 48 (1912), No. 19, p. 336, fig. 1).—A powerful ditching engine is described which pulls a bull ditcher back and forth between the main canals of an irrigation system, thus making a system of connecting ditches between the main canals. It is claimed that the ditcher can be operated at a speed of 3,000 ft. per hour.

A new machine for picking cotton (*Texas Farm Co-operator*, 35 (1912), No. 36, p. 1, fig. 1).—A description is given of a new cotton picker, the mechanism of which consists of a 16-in. cylinder 12 in. long, on which are mounted 20 spindle-shaft frames each carrying 7 spindles, making 140 picking fingers in all. As the cylinder revolves, the spindles are caused to revolve at high speed as they stand in a vertical position and the cotton wraps around them. When they come to a horizontal position they are thrown out of gear and the cotton is stripped off and passed to a basket in the rear. It is claimed that this picker will do the work of from 10 to 12 men, requiring only a team and driver.

A new fruit-tree sprayer, C. PLATZ (*Mitt. Prüf. Stat. Landw. Masch. u. Geräte Halle*, 1912, No. 164, p. 24, figs. 21).—This pamphlet reports the results of investigations on a fruit-tree sprayer, consisting of a pressure cylinder, containing compressed air and the liquid to be applied, an air pump to supply the air pressure, a manometer to measure and gage the air pressure, a gage to regulate the supply of the liquid, and a hose with an adjustable spray nozzle, the whole being fitted with the necessary valves. The theory of the operation of this apparatus is explained and the results of pressure measurements, investigations of power required in pumping the pressure, time duration of discharge, discharge efficiency, and nozzle efficiency are given.

The conclusions are that although the apparatus in practice may not be as efficient under all conditions as the investigations show, yet it combines simplicity, ease of operation, and relatively high efficiency.

Milking machines and mechanical milking, C. HUYER (*Ann. Gembloux*, 22 (1912), No. 5, pp. 251-308, figs. 24).—This article describes several different makes of milking machines operated by suction, compression, and suction and compression combined, and discusses the important principles of their operation and the advantages and disadvantages of mechanical milking in general, pointing out the bad effects that some machines have on the cow, and the advantages of time saving, sanitation, and flexibility of mechanical milking apparatus.

Preliminary examinations of new dairy apparatus, B. MARTINY (*Arch. Duet. Landw. Gesell.*, 1912, No. 219, pp. 101, figs. 41).—This work describes and gives the results of preliminary investigations of new dairy machinery and apparatus, among which are cream separators, churns, refrigerating machinery, heating apparatus, and apparatus for testing milk and cream.

Dairy barn at University of Missouri, C. H. ECKLES (*Wallaces' Farmer*, 37 (1912), No. 16, pp. 751, 752, figs. 2).—The ground plan and general descrip-

plan of the dairy barn at the University of Missouri are given. The construction is intended to be practical and to include at the same time all the necessary features for the best sanitary conditions.

The farm stable, C. W. SLEIGH (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 40-52, figs. 10*).—The essential details of the construction of suitable farm stables are briefly given, emphasizing drainage, ventilation, light, and the comfort of the horses, and presenting original ideas as to roof, wall, floor, and stall construction.

Experiments with improved cow stalls, A. GÜNTART (*Wiener Landw. Ztg., 32 (1912), No. 45, pp. 540, 541, figs. 5*).—The details of a cow stall are given in which a double, adjustable hanging chain is used instead of stanchions.

Cement silo construction (*Agr. Ed. [Kans. Agr. Col.], 4 (1912), No. 6, pp. 79, figs. 29*).—This bulletin gives a detailed outline of the design and construction of the monolithic silo, by G. S. Hine, and of the metal-lath silo, by G. C. Wheeler.

Farm poultry houses, J. B. DAVIDSON and W. A. LIPPINCOTT (*Iowa Sta. Bul. 132, pp. 227-251, figs. 15*).—This bulletin sets forth the essentials of a good poultry house, and emphasizes the necessity of a well-drained location and of dryness, ventilation, sunlight, and simplicity in construction to facilitate cleaning and disinfection. Plans and specifications and details of construction, with bills of material and estimates of cost, of an A-shaped portable colony house, the Iowa Station colony house, and a farm poultry house are also given.

Making a poultry house, M. R. CONOVER (*New York, 1912, pp. 54, pls. 8, figs. 4*).—This work deals with the design and construction of poultry houses and contains chapters with specific suggestions for houses, floors, foundations, roofs, walls, windows and ventilation, doors, nests and roosts, and the run, and a final chapter on general upkeep.

Wire fencing (*Canad. Thresherman and Farmer, 17 (1912), No. 7, pp. 57, 58*).—It is stated that the rusting of modern steel wire is due principally to galvanic action rather than to the thinness of the galvanizing coat, this action being brought about by the difference in chemical composition of different parts of wire manufactured from iron made by the Bessemer and open-hearth processes. When iron containing considerable manganese is used, the different iron particles of different chemical composition are caused to act as different metals, assume different potentials, and when wet cause the flow of electric currents, thus setting up galvanic action and resulting in a decomposition of the wire.

The puddled iron process is presented as a solution to the rust problem since in this process the slag and impurities are more evenly distributed throughout the metal, thus preventing galvanic action. Wire made from puddled iron is more expensive than the others, but is considered an economical investment since it lasts from 4 to 5 times as long.

See also the work of Cushman (*E. S. R., 21, p. 207*).

Labor-savers in the laundry, L. R. BALDERSTON (*Country Gent., 77 (1912), No. 20, p. 13, figs. 5*).—Laundry machinery and equipment is discussed, particularly with reference to farm laundry problems.

RURAL ECONOMICS.

What is the most important problem before our rural people? (*Business America, 12 (1912), No. 5, pp. 49-57*).—Answers to the above question are presented, as follows: Education, by A. C. True; The Problem of Marketing, by F. A. Waugh; Cooperation, by C. S. Barrett; Where Are Rural People to Spend Their Money and Energy? by T. N. Carver; The District School, by E. T. Fair-

child; The Labor Income, by W. H. Wilson; and Enlarging the Agricultural Unit, by E. Davenport.

Cost accounting on farms. G. F. WARREN (*Amer. Agr.*, 90 (1912), No. 13, pp. 263, 264, 265).—An address delivered before the New York State Agricultural Society in which the author compares incomes of farmers and city laborers, and discusses the cost of men and teams on the farm, equipment value, interest on investment, and various factors usually omitted in keeping farm accounts. He states that reports of receipts and expenditures as secured from 2,400 farms in 14 townships in New York indicated that but one-third of the farmers made more than hired man's wages in addition to 5 per cent interest on their capital. A similar study in 6 other States indicated that less than one-third of the farmers make farm wages.

Colonization and immigration. J. S. DUFF (*Rpt. Min. Agr. Ontario, 1911*, pp. 49-53, figs. 2).—Data are presented showing that 2,356 immigrants were sent to Ontario farms by the Bureau of Colonization and Immigration during the year ended October 31, 1911. The number of farm laborers sent by the Salvation Army is reported as 1,431.

The sum of \$20,000 has been set apart for advancing part of the passage money of those who gave promise of being desirable laborers or servants. Repayments were made to an average extent of \$20 each, and the plan is regarded as progressing satisfactorily.

[Cooperative agricultural distribution and production], G. S. BARNES (*Rpt. Indus. and Agr. Coop. Soc. United Kingdom, 1899-1910*, pp. XXXIII-XXXIX, 61-69).—Tables are given showing the number, membership, sales, etc., of the cooperative societies in the United Kingdom, 1895-1909.

It is noted that the number of productive societies increased from 46 in 1895 to 317 in 1909 with an increase in membership from 3,110 to 45,622. They had at the end of 1909 a sale, loan, and reserve capital of £431,348. The total sales for the year amounted to £2,005,314, upon which a profit of £23,663 was made.

A large majority of these organizations are dairying societies scattered over a considerable area and confine their operations to collecting the milk of their members and separating the cream, which they send to a central creamery. "This system of central creameries with a number of auxiliary societies is found to result in economy in manufacturing expenses, and in the reduction in the competition which ensues when a large number of small societies are each endeavoring to secure customers for their output in the same markets."

The number of distributive societies increased from 11 in 1895 to 334 in 1909; the membership from 2,418 to 39,339; the sale, loan, and reserve capital from £7,745 to £162,758; sales from £56,092 to £1,343,390; and profits from £1,632 to £12,613.

Life insurance as a means of promoting the redemption of mortgages and the acquisition of land (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel.*, 3 (1912) No. 8, pp. 129-146).—This article discusses at length some recent applications of the principles of life insurance in connection with agriculture, giving special attention to an experiment made by certain Prussian Landschaften to attain, by means of life insurance, the discharging of mortgages on rural property and the investment of the money of the farmers participating in projects to the advantage of agriculture and of their local communities.

A lengthy bibliography is included.

Agricultural insurance in Denmark (*Internat. Inst. Agr. [Rome], Bul. Bur. Econ. and Soc. Intel.*, 3 (1912), No. 4, pp. 75-102).—This article presents a detailed examination of agricultural insurance against fire, storms, hail, live stock, etc., as they have developed in the Danish peninsula and islands, show-

ing the working details, progress, etc., of each class of insurance for a period of years.

Cooperative insurance societies, 1899-1909. G. S. BARNES (*Rpt. Indus. and Agr. Coop. Soc. United Kingdom, 1899-1910*, p. 76).—There are in England and Wales a number of small cattle and pig insurance societies, the membership of which consists of small holders who raise by periodical assessments a common fund for mutual insurance against loss by the death of their live stock. A table is here given showing the membership, receipts, expenditures, etc., of these societies for each year from 1899 to 1909 inclusive. In 1909 there were 57 active societies with an aggregate membership of 3,954, the receipts during the year amounting to £2,256, and the expenditure to £2,295, of which £387 was for working expenses.

Royal Agricultural Benevolent Institution. W. GILBEY (*Live Stock Jour. [London]*, 76 (1912), No. 2003, p. 197).—This article calls attention to the work of the Royal Agricultural Benevolent Institution of England, which seeks to provide for bona fide farmers, their wives, widows, and unmarried orphan daughters when in distress. At present 1,252 pensioners are maintained at an annual cost of £25,092. Since the institution was founded in 1860 over 4,600 persons have been granted annuities at a total cost of £710,084.

The land mortgage association of Germany. H. C. PRICE (*Wallaces' Farmer*, 37 (1912), No. 39, pp. 1361, 1362).—This article presents a study of the land mortgage associations of Germany and describes their working operations in detail.

The plan usually followed is for the landowners desiring to borrow money to form an association, and instead of each member negotiating his loan individually, they pool their interests and issue bonds against the association. The individual members give their mortgages to the association for their loans and these secure the bonds. As the members are also liable for the bonds to the full extent of their property, this gives the bonds a ready market value and makes them a favorite investment. The farmer receives a bond in return for the mortgage he gives to the association, and this he can sell personally or through the bank established in connection with the association. He usually pays 4 per cent interest on the loan, in addition to 0.25 per cent for operating expenses of the association and 0.75 per cent toward paying off the loan, so that he pays both the interest and the loan in 40 or 45 years. His rate of interest can not be increased during this time nor can his mortgage be foreclosed.

Uruguayan rural credit bank. N. A. GREVSTAD (*Daily Cons. and Trade Rpts. [U. S.]*, 15 (1912), No. 167, p. 300).—This report notes that by an act of January 19, 1912, a section of rural credit with an initial capital of \$500,000 was established in the central bank of Uruguay. The formation of cooperative rural credit banks to be owned by local farmers was also authorized, these to borrow from the central bank in proportion to their relative size and importance, and in turn to loan small sums to their individual members. The central bank will exercise a kind of supervisory control in regulating the general terms of the loans and mortgages, inspecting the accounting at stated periods, and aiding generally to insure the safety and efficiency of the capital invested.

The Rhodesia land bank. W. OLIVE (*Rhodesia Agr. Jour.*, 9 (1912), No. 6, pp. 837-841).—This article describes the conditions and circumstances leading to the establishment of the Rhodesia land bank, together with regulations under which its work is carried on.

This institution was established to stimulate the agricultural development of Rhodesia by the advancement of money to small farmers on the security of landed property, other than town property, or on approved security. Among the principal conditions under which advances are made, are the following: Ad-

vances are made on first mortgage or for the purpose of purchasing land or to enable existing liabilities to be paid off, for the purchase of live stock, agricultural implements, etc., or for effecting improvements on land, including farm buildings, fencing, irrigation works, and afforestation. Loans may not exceed £2,000 to any one person, interest is charged at the rate of 6 per cent per annum, payable semi-annually, and loans are repaid in instalments apportioned over a period not exceeding 10 years, beginning with the third year, but may be paid in a shorter period.

Social centers in the Southwest, C. W. HOLEMAN and C. D. MURPHY (*Dallas Tex.*, 1912, new ed., pp. 34, figs. 11).—This booklet discusses and illustrates the origin and growth of the social center movement in the Southwest, the needs and value of the work, and how social centers may be organized and definitely what can be done to sustain them.

Agricultural statistics, 1911 [Province of British Columbia], A. R. CRABDOCK (*Dept. Agr. Brit. Columbia Bul.* 45, 1912, pp. 38, figs. 5).—Statistics are given relating to the acreage of various crops, the number of live stock, and crop production in each of the specified districts of the Province of British Columbia for 1911. The agricultural resources are also shown as a whole, together with the estimated value of products during the year.

Agricultural statistics 1910-11, E. LAHITTE (*Agr. Statis. Argentine [English Ed.]*, 1910-11, pp. 11+107, pl. 1).—This is a report of the Division of Agricultural Statistics and Rural Economy in Argentina for 1910-11, including data on the area of cultivated land; area, yields, and value of principal crops, and returns per hectare from wheat, flax, corn, and oats from 1891 to 1910; imports and value of farm machinery and implements; rural properties, loans, and mortgages; distribution and consumption of live stock; and exports and value of farm products.

It is noted that Argentina furnished to the United Kingdom 20,013 tons of beef and 55,740 tons of mutton in 1900 and 252,067 tons of beef and 75,507 tons of mutton in 1910. The total value of the agricultural, live stock, forest, hunting, and fishing exports amounted to 153,415,751 pesos (\$148,046,200) in 1900 and 369,081,620 pesos in 1910.

Agricultural statistics of Ireland, with detailed report for the year 1911, T. BUTLER (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1911*, pp. XXIV+147).—This is a detailed report showing the division of land from 1841 to 1911; acreage under crops and yields by counties and Provinces; number and description of holdings; number and ages of live stock; and other agricultural data. The total area of the country is reported at 20,345,323 statute acres, of which 11.5 per cent was planted to corn, green crops, flax, and fruit in 1911, 12.4 per cent was under hay, and 48.4 per cent is classed as rotation and permanent pasture; the remainder consisting of bogs, barren mountains, water, roads, building lands, wastes, etc.

Agricultural statistics, Ireland, 1912, T. BUTLER (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1912*, pp. 31).—Data similar to the above are given for 1912.

Foreign crops, April, 1912, H. C. GRAHAM (*U. S. Dept. Agr., Bur. Statis. Circ.* 36, pp. 15).—This circular notes that British India, with a population of over 300,000,000 people and a total area of 1,138,075,482 acres, has 223,000,000 acres under cultivation. About 20 per cent is irrigated, over $\frac{1}{2}$ from government canals. Of the areas under various crops, rice with 78,731,137 acres in 1910 leads in relative importance, millet follows with 33,108,334 acres, then wheat with 22,789,918 and cotton with 13,172,188 acres. The yield of rice ranges from 700 to 1,200 lbs. per acre, wheat from 510 to 1,250 lbs. and cotton from 30 to 308 lbs. of lint per acre.

A number of tables are given showing crop areas for a number of years; the area irrigated from canals, tanks, wells, etc., by Provinces and States; the area, production, and exports of the principal crops, by countries; and other data.

Foreign crops, May-June, 1912. C. M. DAUCHERTY (*U. S. Dept. Agr., Bur. State. Circ. 37, pp. 19*).—This circular gives notes and statistics respecting crop conditions in various countries, together with tables showing exports of domestic wheat, wheat flour, barley, oats, flaxseed, apples, and cheese from Canada, 1908-1912; the area and production of wheat and flaxseed in British India, by Provinces, 1912 and 1911; imports of wheat and wheat flour into the United Kingdom, 1907-1911; preliminary estimate of areas under grain, etc., in France, May 1, 1912; 1911, and 1910, and final estimate of areas sown in 1911 and 1910; imports of wheat into France and Germany by countries of origin, calendar years 1907-1911; production of olives and olive oil in Spain, 1911-12, by regions; area sown to specified crops in Hungary, 1912 and 1911; area and production of specified crops in Roumania, 1911-1909; and area, production, and exports of wheat in Australia, 1900-1912; and other data.

AGRICULTURAL EDUCATION.

The present trend of agricultural education, L. A. CLINTON (*Penn. Dept. Agr. Bul. 213, 1911, pp. 178-184*).—This is a discussion of the work of the agricultural colleges and experiment stations and of the efforts being made at present to reach the individual farmer.

A redirection of agricultural education, C. L. BEACH (*Ann. Rpt. Conn. Bd. Agr. 43 (1910), pp. 19-25*).—The author briefly discusses the function and scope of the experiment station, the agricultural college, and agricultural extension work, and notes a "redirection of agricultural education at the present time, or rather the shifting of the emphasis, from the activities of the college and the station to that of agricultural extension."

Statistics of state universities and other institutions of higher education partially supported by the State for the year ended June 30, 1911 (*U. S. Bur. Ed. Bul., 1911, No. 19, pp. 23*).—This bulletin includes statistics of agricultural colleges and items of interest concerning progress in them.

Arkansas state agricultural schools, C. H. LANE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 250, pp. 20, pls. 5*).—A report on a system of special agricultural schools established by a State without reference to existing political divisions and furnishing concrete information as to the origin, equipment, organization, and work of the 4 schools comprising it.

Equipment and profitableness of the farms of agricultural education institutions (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3-4, pp. 287-312*).—This is a summary of information compiled from replies to 141 circular letters addressed to the agricultural education institutions in Austria by the minister of agriculture concerning the ownership, object, principal features of work, profits, value of land and equipment, etc., of their farms.

Educational and illustrative material for instruction in rural economics in vocational schools and association lectures, GEIBEL (*Arch. Deut. Landw. Gesell. 1910, No. 167, pp. 255-266*).—This is a description of the illustrative material for instruction in rural economics shown at the Eisenach exhibition of agricultural illustrative material made by agricultural teachers and pupils.

A working erosion model for schools, D. C. ELLIS (*U. S. Dept. Agr., Office Expt. Stas. Circ. 117, pp. 11, figs. 4*).—A description is given of a model designed to illustrate graphically the erosion of hillsides and the destruction of farms in the lower valleys following the complete removal of forests from the hills.

It can easily be constructed in a school building for use by classes in nature study, agriculture, and physical geography.

Farm management field studies and demonstration work in Ohio. L. H. GODDARD (*Ohio Sta. Circ.* 127, pp. 172-182, figs. 2).—An outline is given of a plan which has been adopted by the department of cooperation of the Ohio Station and the Office of Farm Management of this Department, for reorganizing the extension work which has been conducted by the station. This is followed by an account of the purpose and character of the work to be undertaken, previous experience in extension work at the Ohio Station, an agricultural survey of the State, the use of district supervisors and county agents, township supervision, farm management extension work, rural economics, and rural sociology.

Proceedings of the twenty-fifth annual convention of the Association of American Agricultural Colleges and Experiment Stations, edited by J. L. HILLS (*Proc. Assoc. Amer. Agr. Colls. and Expt. Stas.*, 25 (1911), pp. 229).—An account of this convention, held at Columbus, Ohio, November 15-17, 1911, has been given (*E. S. R.*, 26, p. 8).

Proceedings of the sixteenth annual meeting of the American Association of Farmers' Institute Workers, edited by W. H. BEAL and J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Bul.* 251, pp. 77).—An account of this convention, held at Columbus, Ohio, November 13 and 14, 1911, has been previously given (*E. S. R.*, 26, p. 199).

List of agricultural and horticultural officials, institutions, and associations (*Verslag en Meded. Dir. Landb. Dept. Landb. Nijv en Handel*, 1912, No. 2, pp. 120).—This list contains the organization and personnel of the Department of Agriculture, Industry, and Commerce, including the agricultural education service, agricultural education and research institutions, agricultural and horticultural winter schools, itinerant agricultural and horticultural instructors, and agricultural and horticultural associations in the Netherlands.

MISCELLANEOUS.

Thirty-fifth Annual Report of Connecticut State Station, 1911 (*Connecticut State Sta. Rpt.* 1911, pt. 6, pp. XVIII).—This contains the organization list, a report of the board of control, in which are embodied minutes adopted in memory of the late Dr. William H. Brewer, a financial statement for the fiscal year ended September 30, 1911, and a list of corrections to the report.

Annual Report of the New Jersey Stations, 1910 (*New Jersey Stas. Rpt.* 1910, pp. XVIII+424, pls. 60, figs. 5).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1910, and for the College Station for the fiscal year ended June 30, 1910, a brief report by the director, and departmental reports, the experimental features of which are abstracted elsewhere in this issue. A report on the inspection of fertilizers has been previously noted (*E. S. R.*, 24, p. 628), as have also been a report on the inspection of feeding stuffs (*E. S. R.*, 23, p. 475) and an account of peach investigations at Vineland and High Bridge (*E. S. R.*, 23, p. 734).

Monthly Bulletin of the Department Library, July and August, 1912 (*U. S. Dept. Agr., Library Mo. Bul.*, 3 (1912), Nos. 7, pp. 269-229; 8, pp. 235-264).—These numbers contain data for July and August, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES.

Alabama College and Station.—Percy F. Williams, professor of horticulture and forestry and state horticulturist, died December 4, at the age of 29 years. Professor Williams was graduated from the Massachusetts College in 1905, and after a period of commercial landscape gardening became assistant horticulturist in the station in 1908, and head of the department in the college and station two years later. He introduced the study of landscape engineering into the college, and in the station has been the author of numerous horticultural bulletins, notably on the Satsuma orange and the pecan, in which he was particularly interested.

California University and Station.—Additional appointments include President John W. Gilmore, of the Hawaii College, as professor of agronomy, and A. V. Stubenrauch, of the pomological investigations of this Department, as professor of pomology. J. E. Coit, associate professor of pomology and superintendent of the citrus substation at Riverside, has been made professor of citriculture, with headquarters at Berkeley.

Connecticut College.—Roy E. Jones has been appointed instructor in poultry husbandry.

Georgia College.—John T. Newton and J. A. Thrash have been reappointed to the board of trustees. J. E. Turlington has resigned as instructor in agronomy in the extension department.

Iowa College.—A. M. Ten Eyck, formerly superintendent of the Fort Hays substation in Kansas, has been appointed to the farm crops section of the extension department.

Maine University.—George A. Yeaton, orchardist, and Albert Verrill, assistant chemist, have resigned, the former to take up county demonstration work and the latter to enter commercial work. Elmer R. Tobey has been transferred to the position of assistant chemist.

New Jersey College.—A course in home economics is being offered for the first time as one of the short winter courses, beginning November 18 and ending February 28. It includes such special subjects as chemistry of foods, home management, horticulture, dairying, home sanitation, and invalid and infant cookery.

Ohio University and Station.—Over 100 students have been registered in the college of agriculture, which is now considerably the largest in the university. An apprentice course in animal husbandry, in which alternate years are spent in the university and on some live-stock farm selected by the department, is a new feature.

Ross M. Sherwood, George R. Green, E. P. Arzberger, H. R. Watts, J. B. Demaree, J. T. Rogers, and L. E. Melchers, assistants in forestry, animal husbandry, and botany, have severed their connection with the station. The first-named has accepted the position of instructor in poultry husbandry at the Iowa College.

Oregon College.—The stock judging pavilion was burned to the ground October 25, causing an estimated loss of \$7,500. The structure is to be replaced immediately from state funds available for the reconstruction of state buildings destroyed by fire.

Pennsylvania College and Station.—Dr. William A. Buckhout, professor of botany and botanist, died December 3, at the age of 66 years. Dr. Buckhout was a graduate of the college in the class of 1868 and received the master's

degree in 1871 and that of doctor of science in 1904. His long career was spent entirely at the college, beginning in 1871 with his appointment as professor of natural history. Ten years later his title was changed to that of professor of botany and horticulture, and in 1907 to that of professor of botany and botany. For many years he was botanist to the State Board of Agriculture, and in 1888 a member of the State Forestry Commission, doing much to promote interest in forestry. Among his investigations may be mentioned those on the effect of smoke and gas on vegetation.

Clemson College and Station.—Beginning with the next session the college is to give an intensive one-year agricultural course to students over 18 years of age who are familiar with the practical side of farming. Scholarships of \$100 each and free tuition are to be given to one student from each county and to 7 from the State at large.

Recent appointments include F. T. Wilson as assistant professor of agronomy and assistant agronomist, M. P. Somes as assistant professor of entomology and zoology and assistant entomologist, O. M. Clark as assistant professor of horticulture, C. F. Niven as assistant in horticulture, T. R. Haden as assistant in animal husbandry, and F. H. Jeter as assistant to the director.

Wisconsin University and Station.—Sixteen farmers' meetings have been held this fall on county asylum and other public farms throughout the State, to demonstrate the crops grown on these farms by their superintendents in cooperation with, and under the supervision of, the college of agriculture. At 7 of these plowing contests for prizes were held, and at 4 domestic science lectures and demonstrations were given in the kitchens.

The soils department has held 6 demonstration meetings showing the effects of different treatment of the soils in several parts of the State. Most of these were held on the sandy soils where much benefit has been gained by turning under alfalfa and other legumes for green manure.

The dairy cattle breeders of the State have formed 59 community breeders' associations for the purpose of improving the breeding of their cattle and cooperation in buying of feed and marketing of stock, etc.

Frank B. Moody, a graduate of the forestry school of the University of Michigan, has been appointed assistant professor of forestry, and is to organize a school for forest rangers and give courses on woodlot management in the university.

Miscellaneous.—According to a note in *Rural New Yorker*, the General Education Board announced October 25 that it was about to begin free agricultural demonstrations for farmers in the North. Allotments of \$1,500 were made for St. Lawrence County, N. Y., under the direction of the State School of Agriculture at Canton, and of \$8,000 for four counties in Maine, under the direction of the University of Maine.

Lai Kuei Liang, a 1908 graduate of the Massachusetts Agricultural College, has been appointed vice minister of agriculture and forestry in the Chinese Republic, and has begun the issue of the *Chinese Agricultural Journal*.

E. L. Hsieh, a 1909 graduate of the same college, is chief of the bureau of interpretation of the same department, and is engaged in translating into Chinese the agricultural literature of other countries. H. Jen, also a 1909 graduate, is director of the agricultural experiment station at Mukden, Manchuria.

C. S. Orwin, editor of the *Journal of the Royal Agricultural Society*, has been appointed director of the Institute for Research in Agricultural Economics, recently established at Oxford University in cooperation with the Development Commission.

Prof. Etienne Foëx has been nominated assistant director of the Physiological Station at Paris, France.

